

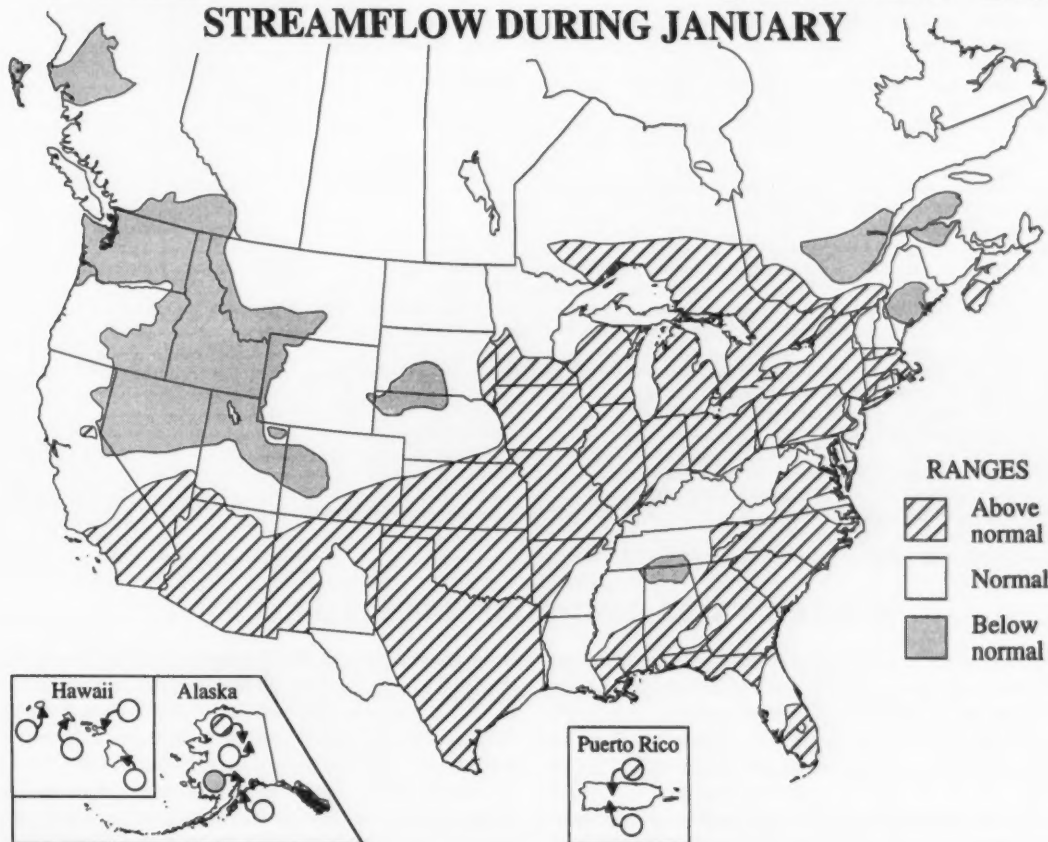
# National Water Conditions

UNITED STATES  
Department of the Interior  
Geological Survey

CANADA  
Department of the Environment  
Water Resources Branch

JANUARY 1993

## STREAMFLOW DURING JANUARY



Beginning at the end of December 1992, a series of storms, which lasted until about the third week of January, caused high water conditions in the Gila and San Francisco Rivers in southwestern New Mexico. From January 6 to 20, southern California coast and mountain areas received from 10 to 25 inches of rain, with several mountain stations in northern San Diego County measuring in excess of 30 inches. In southwestern Utah, flooding occurred in the Santa Clara River and Beaver Dam Wash.

January streamflow was in the normal or above-normal range streamflow at 85 percent of thereporting index stations in the United States, southern Canada, and Puerto Rico during the month.

Below-normal range streamflow occurred in 14 percent of the area of the conterminous United States and southern Canada during January, compared with 26 percent during December. Total flow during January for the reporting index stations in the conterminous United States and southern Canada was 62 percent above median and 43 percent more than last month.

Thirteen new extremes occurred during January, by contrast with no new extremes during December.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged about 42 percent above median and in the above-normal range. Flow of the St. Lawrence River was in the above-normal range for the third consecutive month. Flow of the Mississippi River was in the above-normal range after three consecutive months in the normal range. Flow of the Columbia River was in the below-normal range for the ninth consecutive month.

Month-end index reservoir contents were in the below-average range at 30 of 100 reporting sites, compared with 34 of 100 during December. Contents were in the above-average range at 47 reservoirs. Lake Tahoe, California-Nevada, had no usable storage (compared with a January average of 49 percent) for the 29th consecutive month.

Mean January elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were in the normal range on both Lake Superior and Lake Huron, and in the above-normal range on both Lake Erie and Lake Ontario.

Utah's Great Salt Lake level ended the month at 4,200.30 feet above National Geodetic Vertical Datum, 1.50 foot lower than at the end of January 1992, and 11.55 feet lower than the maximum of record.

Streamflow decreased from that for December in the Hudson Bay, Upper Mississippi River, Missouri River, and Southern Great Plains and Rio Grande basins and increased in the other 8 basins, but was below median only in the Great and other closed and Columbia River basins.

## CONTENTS

	Page
Streamflow (map) .....	1
Surface-water conditions .....	2
Streamflow ranges (map) .....	3
Summary of streamflow ranges (graph) .....	3
Monthly and cumulative departure of total monthly means from total monthly medians (1961-90) for index stations in the conterminous United States and southern Canada .....	3
New maximums at streamflow index stations .....	4
Monthly mean discharge of selected streams (map and graphs) .....	4
Pacific Northwest (Oregon, Washington, Idaho, and Montana) streamflow (graphs and map) .....	6
Pacific Northwest (Oregon, Washington, Idaho, and Montana) reservoir index stations (map and graphs) .....	7
California streamflow (graphs and map) .....	8
California streamflow, combined reservoir contents, and ground-water levels (graphs) .....	9
California reservoir index stations (map and graphs) .....	10
Hydrographs for the "Big Three" rivers - combined and individual flows (graphs) .....	12
Dissolved solids and water temperatures at downstream sites on four large rivers .....	12
Flow of large rivers .....	13
Usable contents of selected reservoirs and reservoir systems (map and graphs) .....	14
Usable contents of selected reservoirs and reservoir systems .....	15
Great Lakes elevations (graphs) .....	16
Fluctuations of the Great Salt Lake, October 1987 through January 1993 (graph) .....	16
Streamflow during January 1993 and reservoir storage near the end of January 1993 (map) .....	17
Streamflow during January 1992 and reservoir storage near the end of January 1992 (map) .....	17
Actual monthly streamflow, 1992 and 1993 water years, compared with median monthly streamflow, 1961-90 (graphs) .....	18
Monthly departure of actual streamflow (October 1987-January 1993) from median streamflow, 1961-90 (graphs) .....	19
Ground-water conditions (and map) .....	20
Water levels in key observation wells in some representative aquifers in the conterminous United States .....	21
New extremes at ground-water index stations .....	22
Monthend ground-water levels in selected wells (map and graphs) .....	23
Total precipitation and Percentage of normal precipitation (maps) .....	24
January weather summary .....	25
United States climate in historical perspective (with graphs) .....	25
pH of precipitation for December 21-January 24, 1992 (map) .....	26
Distribution of precipitation-weighted mean pH for all NADP/NTN sites having one or more weekly samples for December 21-January 24, 1992 (graph) .....	26
Temperature and precipitation outlooks for February-April 1993 (maps) .....	27
Explanation of data .....	27

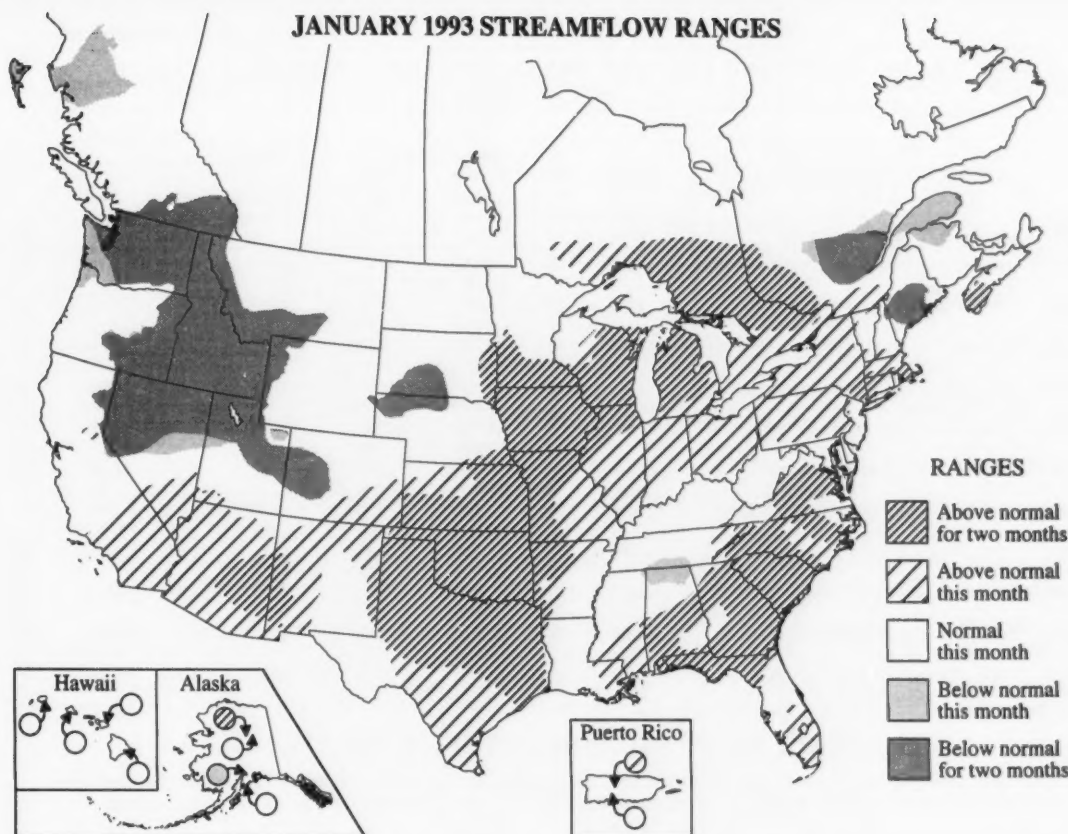
## SURFACE-WATER CONDITIONS DURING JANUARY 1993

Beginning at the end of December 1992, a series of storms, which lasted until about the third week of January, caused high water conditions in the Gila and San Francisco Rivers in southwestern New Mexico. The Verde River below Tangle Creek, above Horseshoe Dam (upstream from Phoenix) exceeded the peak discharge of record—94,800 cubic feet per second (ft<sup>3</sup>/s) in 1980—by an estimated 50,000 ft<sup>3</sup>/s. Although flood frequencies for peak discharges generally were in the 10-50 year range, with the exception of peak discharge of the Verde River (exceeded 50 years), the flooding on a Statewide basis was thought to be the worst in history. From January 6 to 20, southern California coast and mountain areas received from 10 to 25 inches of rain, with several mountain stations in northern San Diego County measuring in excess of 30 inches. In Temecula (on Interstate Highway 15 a few miles south of the junction of Interstate Highways 15 and 215 and about 50 miles north of San Diego) on the night of January 16-17, Murietta Creek overflowed its banks sending floodwaters through the "old town" and western sections of town. Severe damage occurred, with the main problem being tons of silt and water damage. Although no peak discharge or recurrence interval data were available, both the flow and stage at the gage on the Murieta Creek at Temecula exceeded those of the previous peak of record. A series of regional winter storms from the Pacific Coast passed through southern and central Nevada. Precipitation associated with these storms resulted in the first major flows within the Yucca Mountain Project regional streamflow monitoring network since 1984. In southwestern

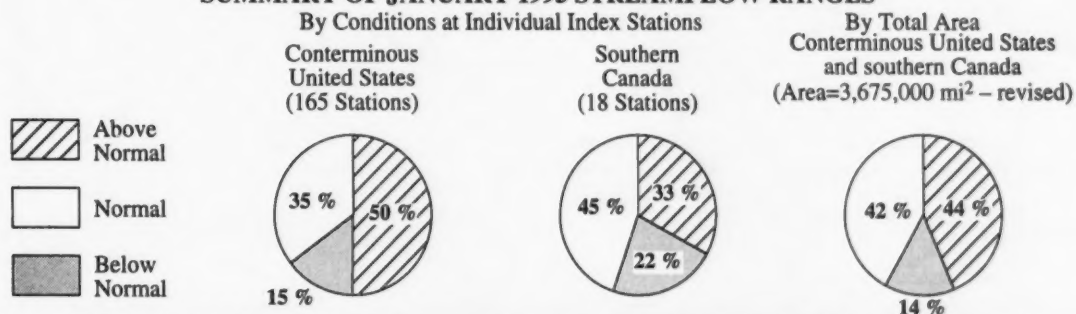
Utah, flooding occurred in the Santa Clara River and Beaver Dam Wash (estimated peak discharge on Beaver Dam Wash near Littlefield, Arizona, was 4,000-5,000 ft<sup>3</sup>/s). Records for snowfall and total precipitation were set for the month of January at the Salt Lake City airport. More than 52 inches of snow fell during the month with an equivalent of 3.23 inches of water. The 52 inches of snow is an all-time record snowfall for any month and the water equivalent is a record for January. Several stations in southwest Utah had the wettest month on record: Bryce Canyon National Park (7.38 inches of precipitation); Kanab (7.45 inches); and Zion National Park (7.53 inches). Juneau, Alaska, had its second wettest January on record with precipitation of 9.11 inches and its second wettest January day on record with 2.09 inches on January 31.

According to the *California Water Supply Outlook* (published by the California Department of Water Resources), "the latest Sacramento River Index gives a 90 percent chance that even with fairly dry conditions for the rest of the season, the Sacramento basin will produce a runoff of about 75 percent of average. Although that is over 150 percent better than last year, it's still not enough to end the drought. The question is, will there be enough runoff to regain a sufficient amount of the reservoir storage lost during the previous 6-year drought? At this point there is considerable optimism. If normal weather occurs during the remaining 40 percent of the season, recovery of most systems will occur and even the drought watchers may say 'drought's over.'"

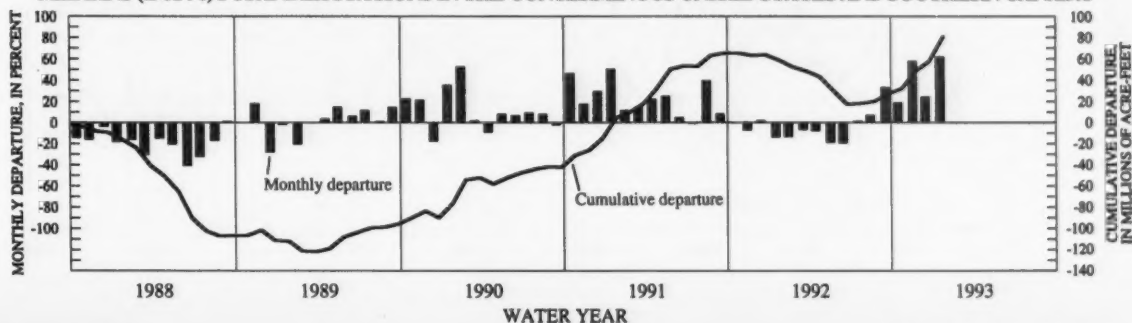
(Continued on page 4)



### SUMMARY OF JANUARY 1993 STREAMFLOW RANGES



### MONTHLY AND CUMULATIVE DEPARTURE OF TOTAL MONTHLY MEANS FROM TOTAL MONTHLY MEDIANS (1961-90) FOR INDEX STATIONS IN THE CONTERMINOUS UNITED STATES AND SOUTHERN CANADA

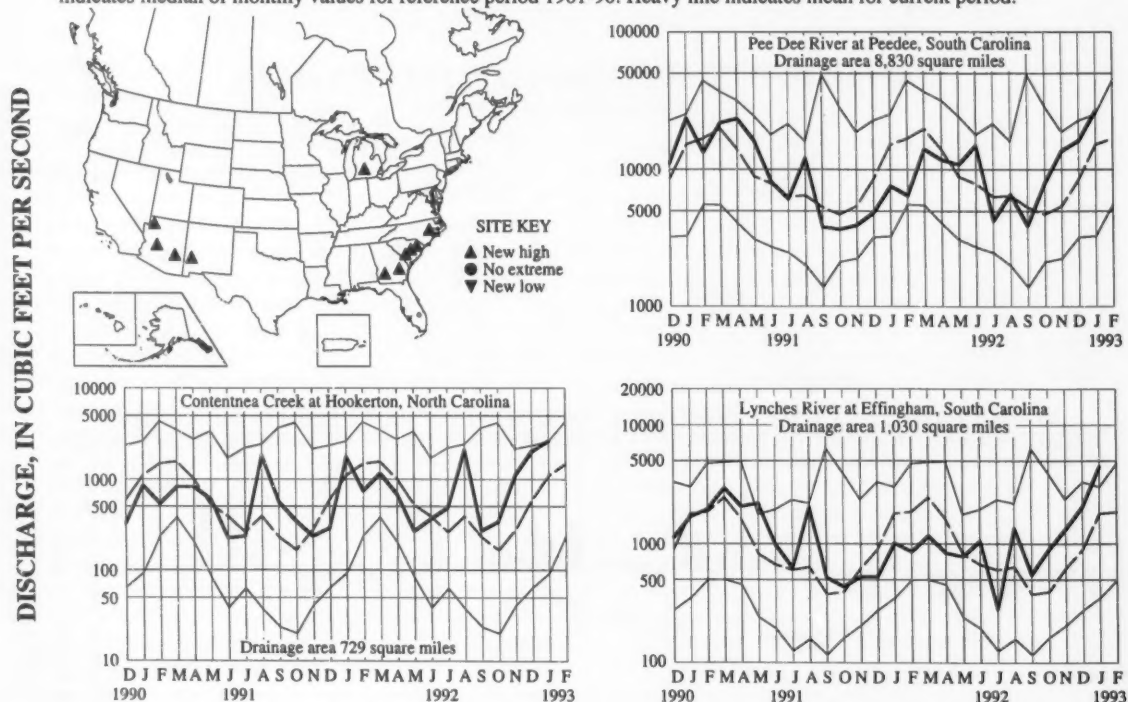


## NEW MAXIMUMS DURING JANUARY 1993 AT STREAMFLOW INDEX STATIONS

Station number	Stream and place of determination	Drainage area (square miles)	Years of record	Previous January maximums (period of record)		January 1993			
				Monthly mean in cfs (year)	Daily mean in cfs (year)	Monthly mean in cfs	Percent of median	Daily mean in cfs	Day
02091500	Contentnea Creek at Hookerton, North Carolina	729	65	2,610 (1987)	8,300 (1987)	2,645	240	5,210	13
02131000	Pee Dee River at Pee Dee, South Carolina	8,830	55	25,280 (1946)	64,800 (1978)	26,690	176	...	...
02132000	Lynches River at Effingham, South Carolina	1,030	64	2,999 (1982)	7,920 (1978)	4,462	249	8,030	15
02173500	North Fork Edisto River at Orangeburg, South Carolina	683	55	1,555 (1964)	2,910 (1972)	2,208	215	4,890	10
02226000	Altamaha River at Doctortown, Georgia	13,600	62	44,170 (1946)	75,200 (1987)	46,230	222	91,500	17
02317500	Alapaha River at Statesville, Georgia	1,400	62	4,998 (1987)	10,600 (1987)	5,745	418	15,900	21
04112500	Red Cedar River at East Lansing, Michigan	355	63	710 (1973)	2,400 (1973)	736	533	1,750	6
09415000	Virgin River at Littlefield, Arizona	5,090	64	775 (1969)	8,420 (1989)	1,041	505	9,010	18
09430500	Gila River near Gila, New Mexico	1,864	66	893 (1949)	6,920 (1949)	1,480	1,558	5,740	19
09448500	Gila River at Head of Safford Valley near Solomon, Arizona	7,896	79	10,130 (1916)	32,500 (1915)	13,990	5,125	55,700	19
09508500	Verde River below Tangle Creek, above Horseshoe Dam, Arizona	5,872	48	2,706 (1980)	26,200 (1969)	11,600	3,061	99,100	8

## MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

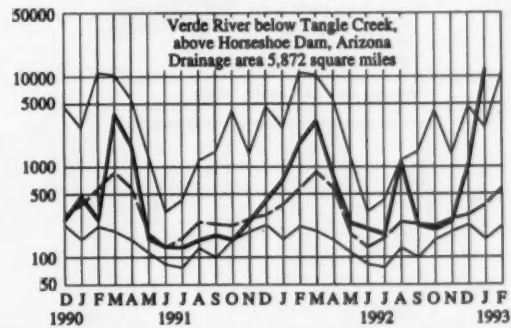
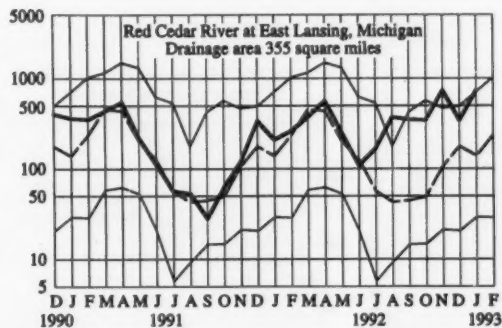
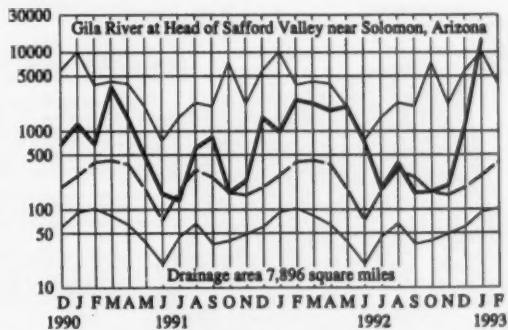
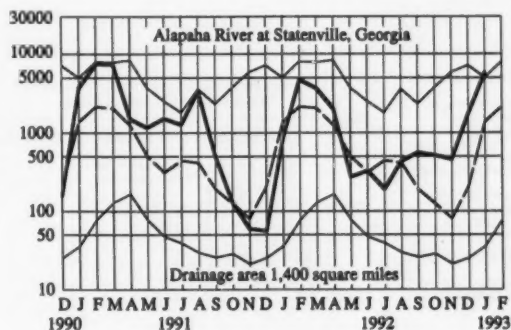
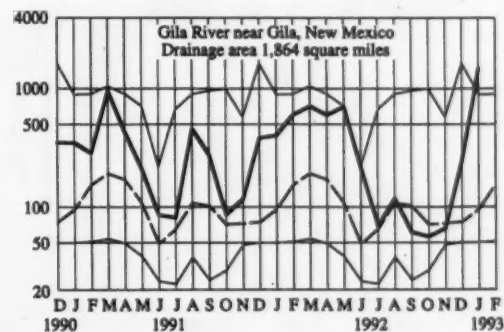
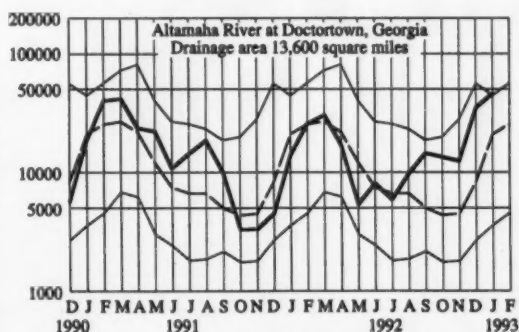
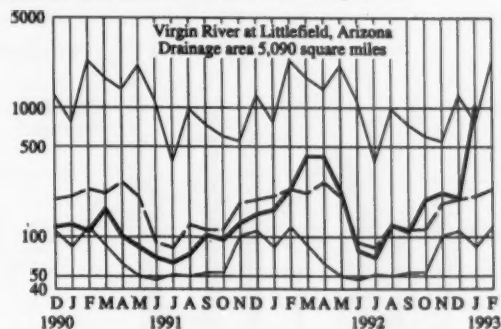
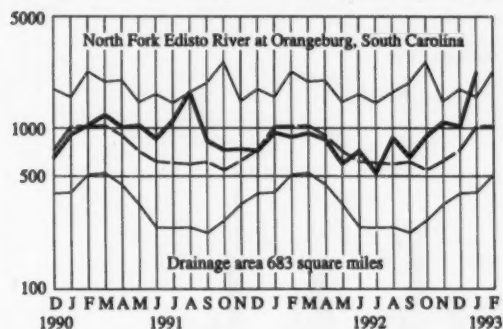
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period 1961-90. Heavy line indicates mean for current period.



## MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

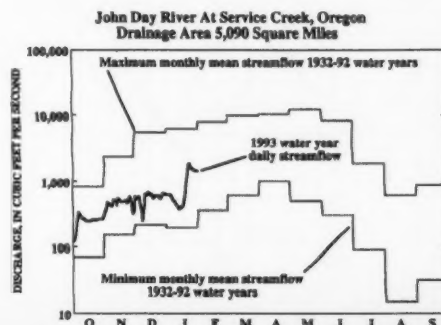
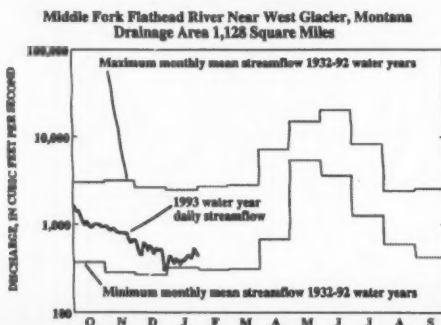
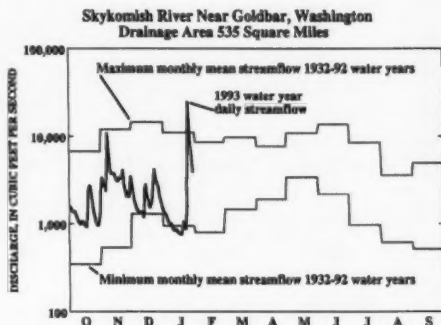
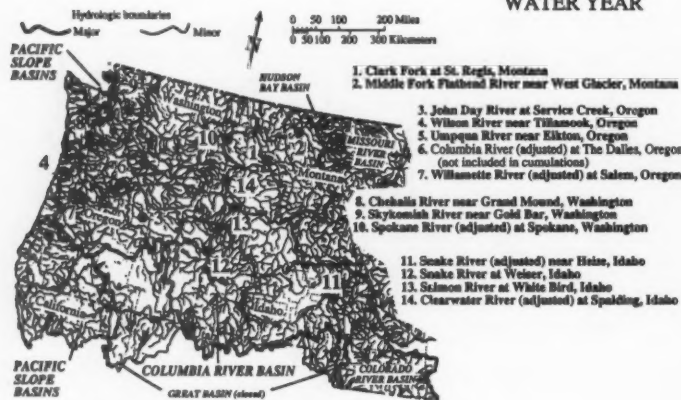
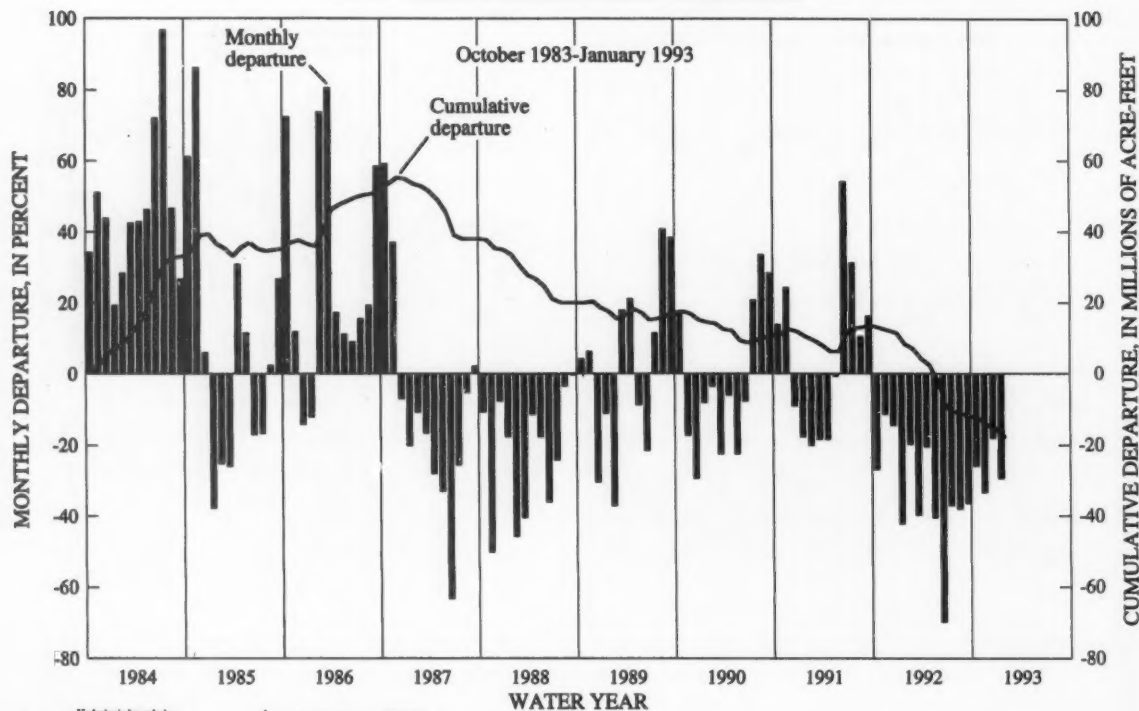
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1961-90. Heavy line indicates mean for current period.

DISCHARGE, IN CUBIC FEET PER SECOND

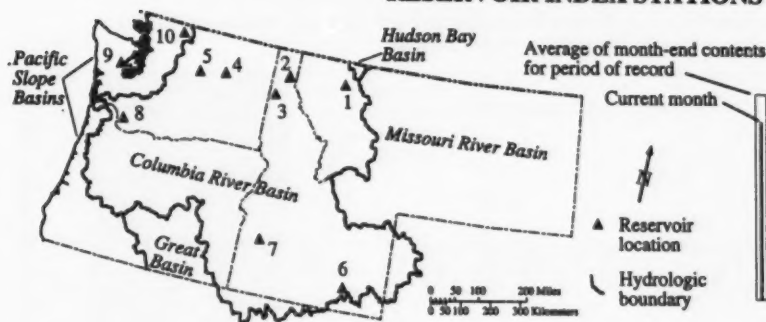


## PACIFIC NORTHWEST STREAMFLOW

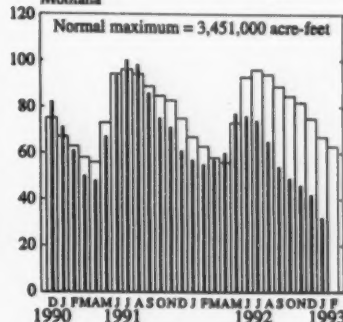
Monthly And Cumulative Departure Of Total Monthly Means From Total Monthly Medians (1961-90)  
At 13 Pacific Northwest Streamflow Index Stations



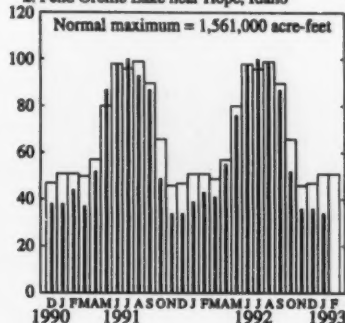
# PACIFIC NORTHWEST (OREGON, WASHINGTON, IDAHO, AND MONTANA) RESERVOIR INDEX STATIONS



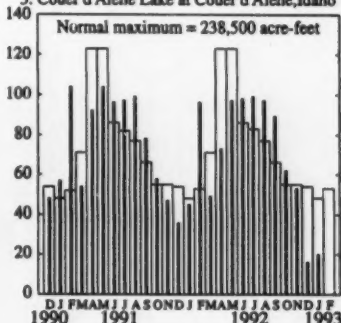
1. Hungry Horse reservoir near Hungry Horse, Montana



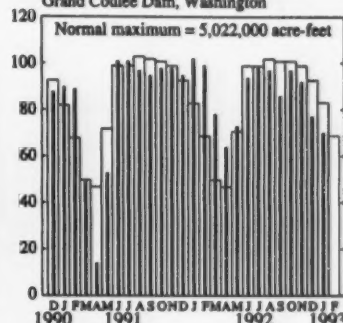
2. Pend Oreille Lake near Hope, Idaho



3. Couer d'Alene Lake at Couer d'Alene, Idaho

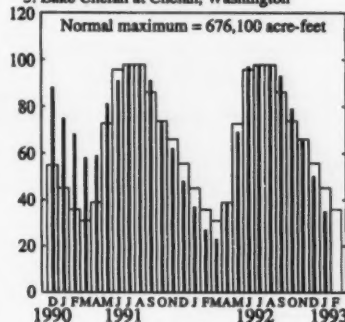


4. Franklin D. Roosevelt Lake at Grand Coulee Dam, Washington

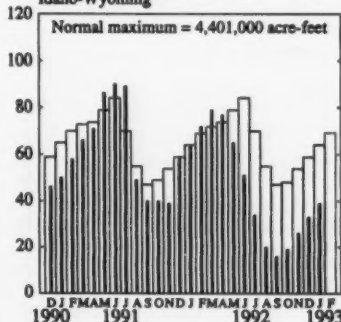


PERCENT OF NORMAL MAXIMUM

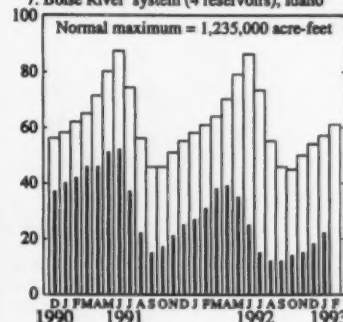
5. Lake Chelan at Chelan, Washington



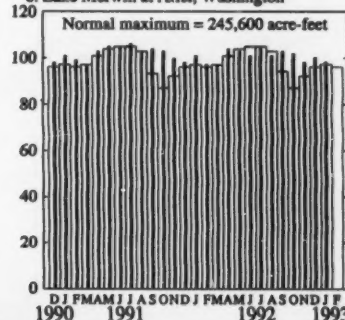
6. Upper Snake River system (8 reservoirs), Idaho-Wyoming



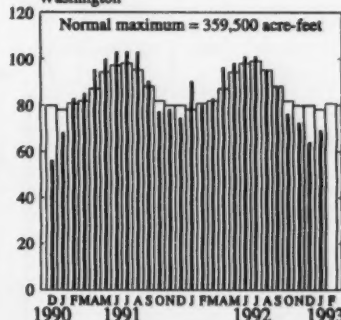
7. Boise River system (4 reservoirs), Idaho



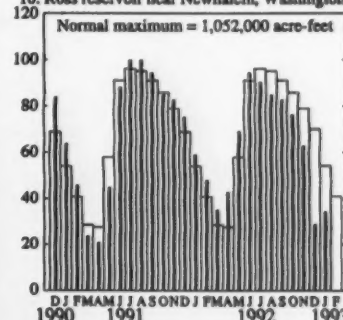
8. Lake Merwin at Ariel, Washington



9. Lake Cushman near Hoodport, Washington

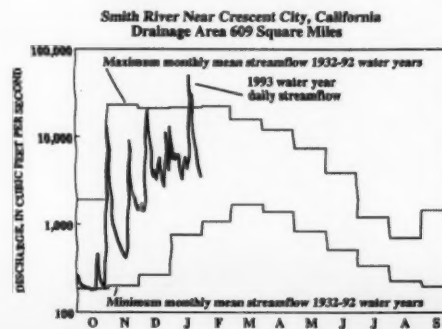
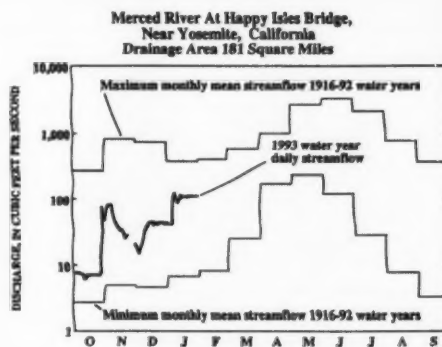
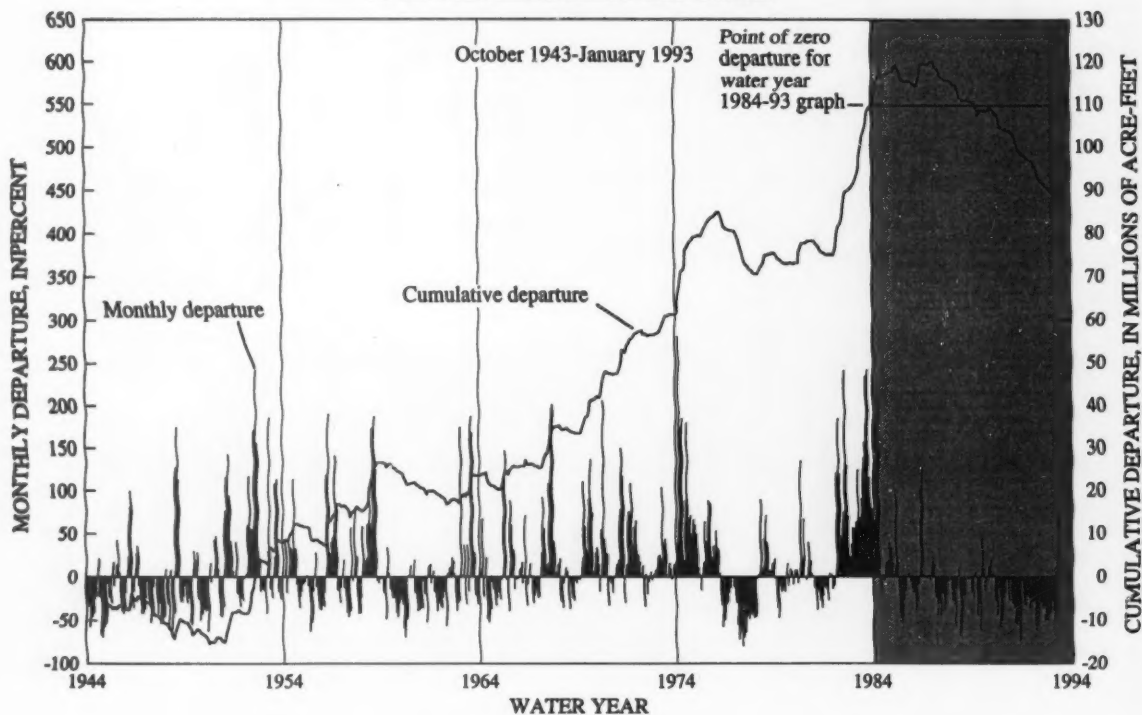


10. Ross reservoir near Newhalem, Washington



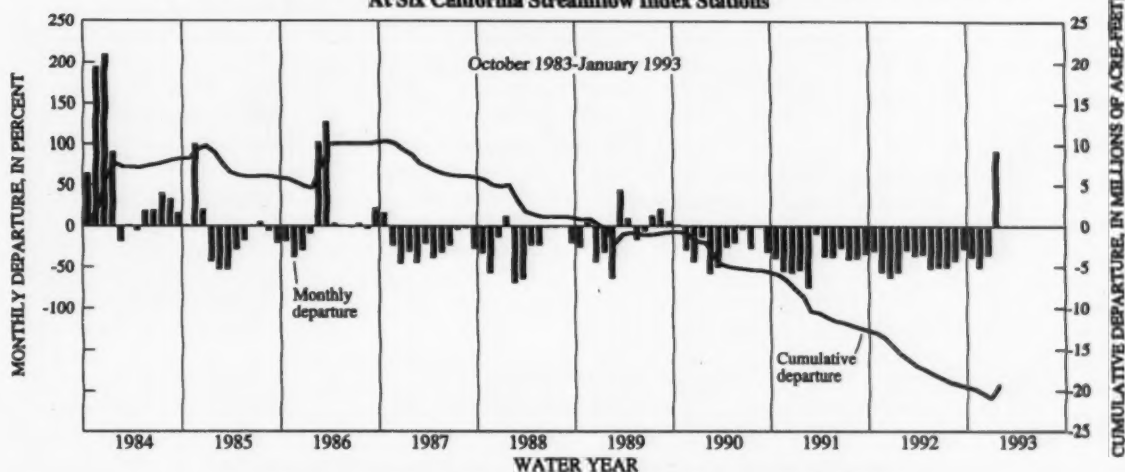
## CALIFORNIA STREAMFLOW

Monthly And Cumulative Departure Of Total Monthly Means From Total Monthly Median (1961-90)  
At Six California Streamflow Index Stations

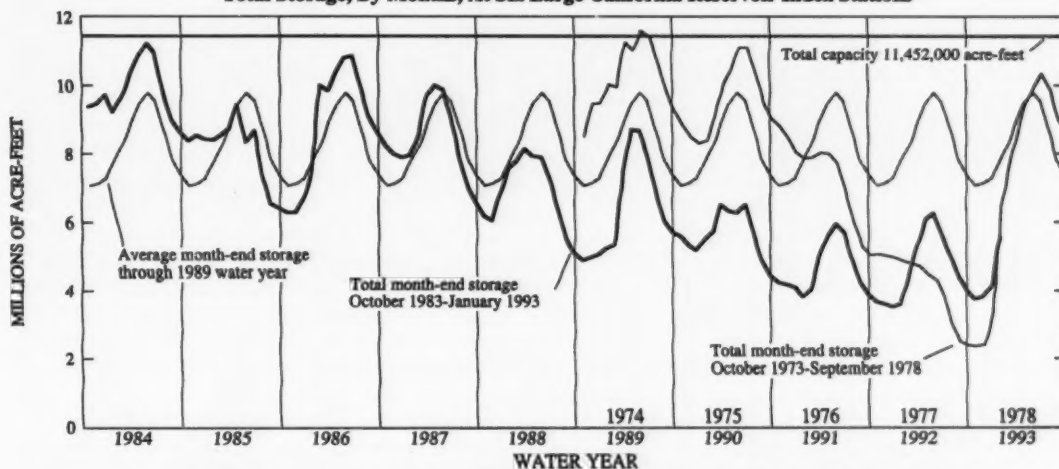


# CALIFORNIA STREAMFLOW, COMBINED RESERVOIR CONTENTS, AND GROUND-WATER LEVELS

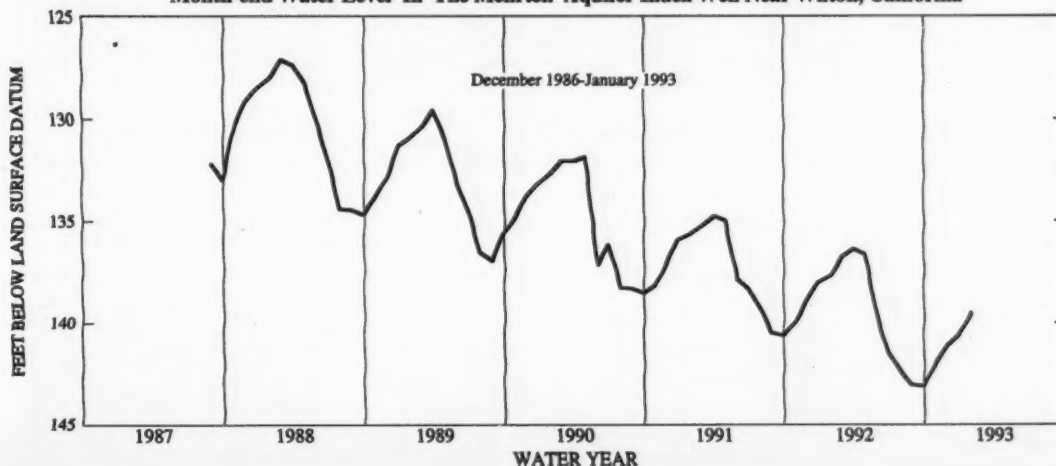
Monthly And Cumulative Departure Of Total Monthly Means From Total Monthly Medians (1961-90)  
At Six California Streamflow Index Stations



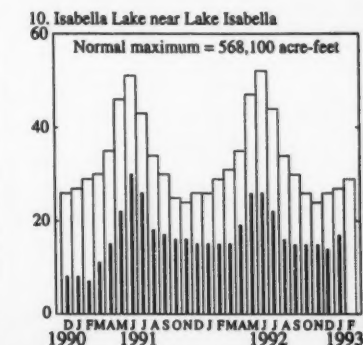
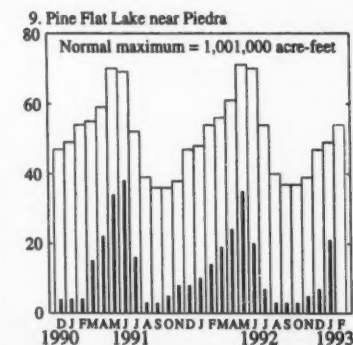
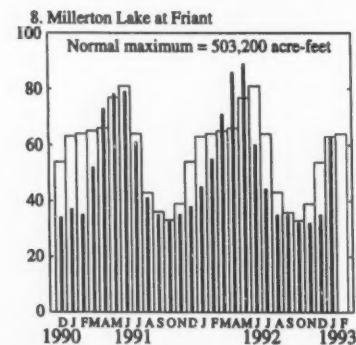
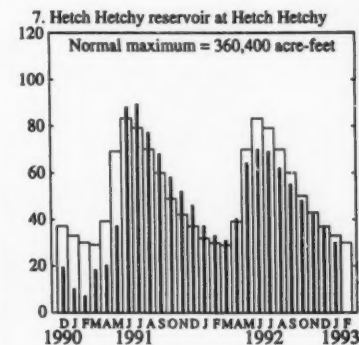
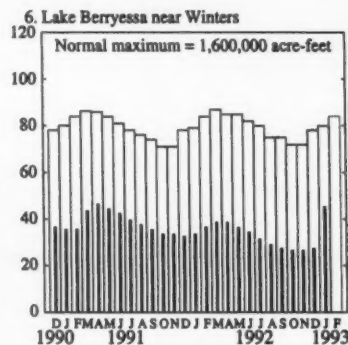
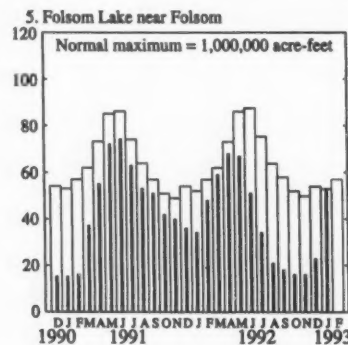
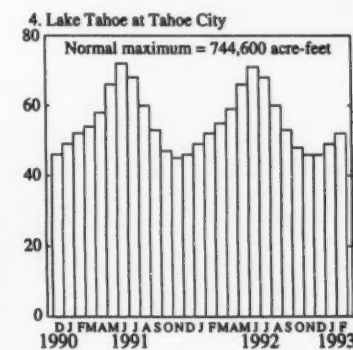
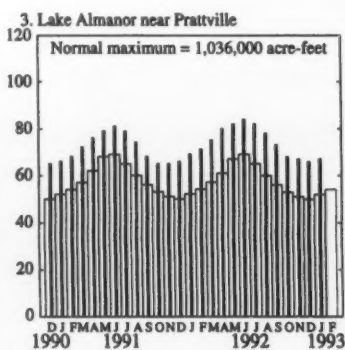
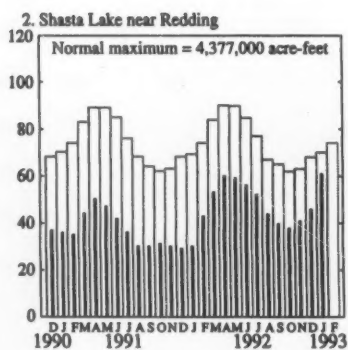
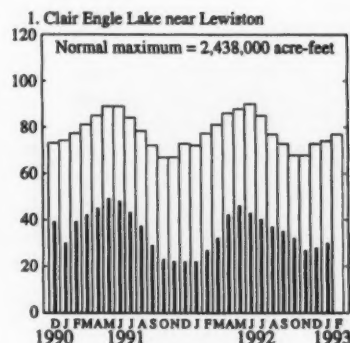
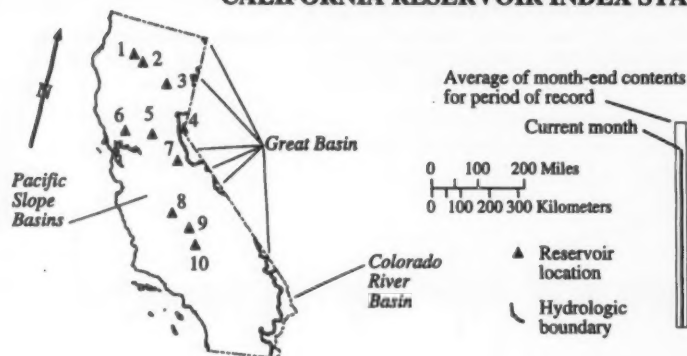
## Total Storage, By Months, At Six Large California Reservoir Index Stations



## Month-end Water Level In The Mehrten Aquifer Index Well Near Wilton, California



# CALIFORNIA RESERVOIR INDEX STATIONS



(Continued from page 2)

January streamflow increased from that for December at 100 index stations, remained the same at 2 index stations, and decreased at 91 index stations, resulting in normal or above-normal range streamflow at 85 percent of the 193 reporting index stations in the United States, southern Canada, and Puerto Rico during the month, compared with 83 percent last month and 80 percent during January 1992.

Below-normal range streamflow occurred in 14 percent of the area of the conterminous United States and southern Canada during January, compared with 26 percent during December, and 17 percent during January 1992. Total flow of 1,030,000 ft<sup>3</sup>/s during January for 175 reporting index stations in the conterminous United States and southern Canada was 62 percent above median, 43 percent more than last month, and 89 percent more than flow during January 1992.

Thirteen new extremes occurred during January, by contrast with no new extremes during December. Hydrographs for the 13 streamflow stations at which the new extremes occurred—in North Carolina, South Carolina (3), Georgia (2), Michigan, Arizona (3), and New Mexico—are on pages 4-5.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 1,383,000 ft<sup>3</sup>/s, about 42 percent above median and in the above-normal range, after an 8 percent increase in flow from December to January. Flow of the St. Lawrence River was in the above-normal range for the third consecutive month despite a 5 percent decrease from last month. Flow of the Mississippi River was in the above-normal range following a 20 percent increase from last month after the three consecutive months in the normal range. Flow of the Columbia River was in the below-normal range for the ninth consecutive month. Hydrographs for the combined and individual flows of the "Big 3" and a table of dissolved solids and water temperature data for four large river stations are on page 12. Flow data for the "Big 3" and 41 other large rivers are given in the Flow of Large Rivers table on page 13.

Month-end index reservoir contents were in the below-average range (below the month-end average for the period of record by more than 5 percent of normal maximum contents) at 30 of 100 reporting sites, compared with 34 of 100 during December, and 28 of 100 at the end of January 1992, including most reservoirs in North Dakota, Nebraska, Montana, Washington, Idaho, Wyoming, Utah, the Colorado River Storage Project, California, and Nevada. Contents were in the above-average range at 47 reservoirs (compared with 45 last month, and 42 a year ago), including most reservoirs in Quebec, New Hampshire, Vermont, Massachusetts, New Jersey, the Carolinas, Georgia, Alabama, the Tennessee Valley, Wisconsin, Minnesota, Oklahoma, Texas, New Mexico, Arizona, and also Lake Mead and Lake Mohave in Arizona-Nevada. Reservoirs with contents in the below-average range and significantly lower than last year (with normal maximum contents of at least 1,000,000 acre-feet) are: Lake Sakakawea, North Dakota; Fort Peck, and Hungry Horse, Montana; Ross and Franklin D. Roosevelt Lake, Washington; Upper Snake River system, Idaho-Wyoming; the Pathfinder system, Wyoming; and Bear Lake, Idaho-Utah. Lake Tahoe, California-Nevada, had no usable

storage (compared with a January average of 49 percent) for the 29th consecutive month. One other reservoir had contents below 10 percent of normal maximum near the end of the month (January average in parentheses): and Rye Patch, 1 percent (47), Nevada. Graphs of contents for seven reservoir index stations—in New Hampshire, Pennsylvania, the Tennessee Valley, Minnesota, Oklahoma-Texas, Wyoming, and Arizona-Nevada—are shown on page 14 and contents for the 100 reporting reservoirs are listed on page 15. Reservoir storage conditions near the end of January 1993 and January 1992 are shown on monthly streamflow maps on page 17.

Mean January elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were in the normal range and above median on Lake Superior, in the normal range and below median on Lake Huron, in the above-normal range on both Lake Erie and Lake Ontario. Levels rose from those for December except on Lake Superior. January levels ranged from 0.59 foot higher (Lake Erie) to 0.46 foot lower (Lake Superior) than those for December. Monthly means have been in the normal range for 7 months on Lake Superior and 30 months on Lake Huron, and in the above-normal range on both Lake Erie and Lake Ontario for 3 months. January 1993 levels ranged from 0.16 foot lower (Lake Superior) to 1.76 feet higher (Lake Ontario), than those for January 1992. Stage hydrographs for the master gages on Lake Superior, Lake Huron, Lake Erie, and Lake Ontario are on page 16.

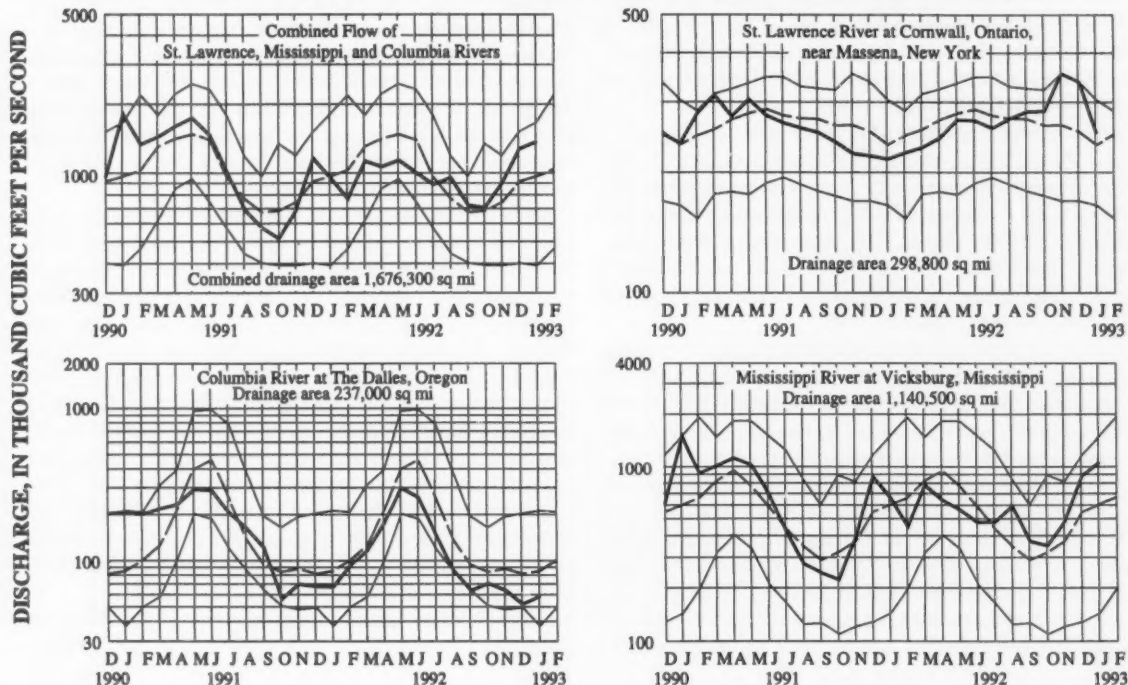
Utah's Great Salt Lake level (graph on page 16) rose 0.20 foot through midmonth, then rose another 0.10 foot through monthend, ending the month at 4,200.30 feet above National Geodetic Vertical Datum. Lake level was 1.50 foot lower than at the end of January 1992, and 11.55 feet lower than the maximum of record which occurred in June 1986 and March-April 1987.

Maps on page 17 show streamflow conditions during January 1993 and January 1992. January 1993 has almost twice as much area in the above-normal range, about a fifth less area in the below-normal range, and about a third less area in the normal range than January 1992. Below-normal range streamflow occurred during both months in parts of California, Nevada, Oregon, Washington, British Columbia, Idaho, Montana, Wyoming, Utah, Colorado, and Quebec. Above-normal range streamflow occurred during both months in parts of Alaska, Arizona, New Mexico, Oklahoma, Texas, Louisiana, Mississippi, North Carolina, Missouri, Nebraska, Iowa, Minnesota, South Dakota, Wisconsin, Michigan, Ontario, Quebec, New York, Vermont, and Nova Scotia. Both maps also show reservoir storage near the end of the month at all reporting index reservoir stations for comparison with streamflow.

Graphs for 12 hydrologic areas (page 18) compare monthly streamflow for the 1993 and 1992 water years with median monthly streamflow for 1961-90 and show (page 19) monthly percent departure of streamflow from median for the 1988-93 water years. Streamflow decreased from that for December in the Hudson Bay, Upper Mississippi River, Missouri River, and Southern Great Plains and Rio Grande basins and increased in the other 8 basins. Streamflow was below median in the Great and other closed, and Columbia River basins, and above median in the other 10 basins.

## HYDROGRAPHS FOR THE "BIG THREE" RIVERS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1961-90. Heavy line indicates mean for current period.



Provisional data; subject to revision

### DISSOLVED SOLIDS AND WATER TEMPERATURES FOR JANUARY 1993 AT DOWNSTREAM SITES ON FOUR LARGE RIVERS

Station number	Station name	January data of following calendar years	Stream discharge during month Mean (ft <sup>3</sup> /s)	Dissolved-solids concentration <sup>1</sup>		Dissolved-solids discharge <sup>1</sup>			Water temperature <sup>2</sup>		
				Mini-	Maxi-	Mean	Mini-	Maxi-	Mean	Mini-	Maxi-
				mum (mg/L)	mum (mg/L)						
01463500	Delaware River at Trenton, New Jersey, (Morrisville, Pennsylvania)	1993	16,060	76	104	3,898	2,593	6,388	3.0	2.0	5.5
		1945-92	12,380	62	201	<sup>3</sup> 2,605	758	20,800	<sup>3</sup> 1.5	0	7.5
		(Extreme yr)	48,381	(1951, 1960)	(1959)	(1981)	(1976)				
07289000	Mississippi River at Vicksburg, Mississippi	1993	1,071,800	177	218	593,300	547,200	648,300	...	...	...
		1976-92	709,700	149	299	372,600	128,000	735,300	4.5	0	10.0
		(Extreme yr)	4611,200	(1991)	(1981)	(1981)	(1991)				
06934500	Missouri River at Hermann, Missouri. (60 miles west of St. Louis, Missouri)	1993	101,900	180	282	66,290	62,100	77,100	5.5	3.0	8.0
		1976-92	47,980	159	553	54,500	18,100	160,000	2.5	0	7.5
		(Extreme yr)	442,640	(1979)	(1977)	(1981)	(1985)				
14246900	Columbia River at Beaver Army Terminal, near Quincy, Oregon (streamflow station at The Dalles, Oregon)	1993	139,800	...	...	...	...	...	3.0	1.0	6.5
		1976-92	170,200	76	125	47,840	24,300	79,800	4.0	0	9.0
		(Extreme yr)	4,586,480	(1978)	(1983)	(1979)	(1984)				

<sup>1</sup>Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.

<sup>2</sup>To convert °C to °F: [(1.8 x °C) + 32] = °F.

<sup>3</sup>Mean for 8-year period (1983-91).

<sup>4</sup>Median of monthly values for 30-year reference period, water years 1961-90, for comparison with data for current month.

<sup>5</sup>Adjusted

# FLOW OF LARGE RIVERS DURING JANUARY 1993

Provisional data; subject to revision

Station number	Stream and place of determination	Drainage area (square miles)	Average discharge through September 1991 (cubic feet per second)	January 1993					Date
				Monthly mean discharge (cubic feet per second)	Percent of median monthly discharge 1961-90	Change in discharge from previous month (percent)	Discharge near end of month		
							Cubic feet per second	Million gallons per day	
01014000	St. John River below Fish River at Fort Kent, Maine ...	5,665	9,693	2,601	93	-23	2,120	1,370	31
01318500	Hudson River at Hadley, New York.....	1,664	2,925	* 3,130	195	9	1,440	930	31
01357500	Mohawk River at Cohoes, New York.....	3,456	5,673	* 7,900	196	40	3,000	1,900	31
01463500	Delaware River at Trenton, New Jersey.....	6,780	11,660	* 16,060	192	21	9,920	6,410	31
01570500	Susquehanna River at Harrisburg, Pennsylvania.....	24,100	34,200	* 56,680	240	45	30,300	19,600	31
01646500	Potomac River near Washington, District of Columbia...	11,560	11,070	* 117,800	157	-18	...	...	...
02105500	Cape Fear River at William O. Huske Lock, near Tarheel, North Carolina.	4,852	4,933	* 13,070	178	141	...	...	...
02131000	Pee Dee River at Peedee, South Carolina.....	8,830	9,903	* 26,690	176	64	26,500	17,100	31
02226000	Altamaha River at Doctortown, Georgia.....	13,600	13,570	46,230	222	32	37,300	24,100	31
02320500	Suwannee River at Branford, Florida.....	7,880	7,038	* 14,440	267	87	23,500	15,200	31
02358000	Apalachicola River at Chattahoochee, Florida .....	17,200	22,137	* 50,600	157	12	37,500	24,200	31
02467000	Tombigbee River at Demopolis lock and dam, near Coatspa, Alabama.	15,385	23,700	64,290	146	74	33,600	21,700	31
02489500	Pearl River near Bogalusa, Louisiana.....	6,573	10,102	26,990	193	75	34,200	22,100	31
03049500	Allegheny River at Natrona, Pennsylvania.....	11,410	119,690	* 147,470	235	79	33,400	21,600	28
03085000	Monongahela River at Braddock, Pennsylvania.....	7,337	112,540	115,090	112	-17	16,600	10,700	28
03193000	Kanawha River at Kanawha Falls, West Virginia.....	8,367	12,550	14,350	92	-10	10,600	6,850	31
03234500	Scioto River at Higby, Ohio .....	5,131	4,654	* 14,200	382	312	4,610	2,980	31
03294500	Ohio River at Louisville, Kentucky <sup>2</sup> .....	91,170	115,900	* 218,000	173	49	173,000	112,000	31
03377500	Wabash River at Mount Carmel, Illinois .....	28,635	27,880	* 79,260	292	136	81,300	52,600	31
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wisconsin. <sup>2</sup>	6,010	4,248	* 5,221	129	-30	4,720	3,100	31
04264331	St. Lawrence River at Cornwall, Ontario, near Massena, New York. <sup>4*</sup>	298,800	245,300	* 252,000	107	-26	288,000	186,000	31
02NG001	St. Maurice River at Grand Mere, Quebec .....	16,300	124,290	† 3,500	33	-63	22,000	14,200	24
05082500	Red River of the North at Grand Forks, North Dakota...	30,100	2,565	823	64	-4	948	612	31
05133500	Rainy River at Manitou Rapids, Minnesota .....	19,400	9,036	8,500	92	-6	9,000	5,800	27
05330000	Minnesota River near Jordan, Minnesota.....	16,200	7,062	* 2,135	357	-50	1,600	1,030	31
05331000	Mississippi River at St. Paul, Minnesota <sup>*</sup> .....	36,800	115,890	6,126	115	-31	5,380	3,480	31
05365500	Chippewa River at Chippewa Falls, Wisconsin .....	5,650	5,072	2,770	92	-24	1,400	900	31
05407000	Wisconsin River at Muscoda, Wisconsin .....	10,400	8,666	* 10,300	155	-4	8,600	5,560	31
05446500	Rock River near Joslin, Illinois.....	9,549	6,161	* 12,510	322	26	8,000	5,200	31
05474500	Mississippi River at Keokuk, Iowa <sup>*</sup> .....	119,000	64,070	* 72,250	184	-19	55,000	35,500	31
06214500	Yellowstone River at Billings, Montana.....	11,795	6,965	† 2,022	77	-22	2,180	1,410	31
06934500	Missouri River at Hermann, Missouri <sup>*</sup> .....	524,200	76,940	* 101,900	239	-26	96,200	62,200	31
07289000	Mississippi River at Vicksburg, Mississippi <sup>2</sup> .....	1,140,500	583,000	1,072,000	175	21	1,100,000	701,200	29
07331000	Washita River near Dickson, Oklahoma.....	7,202	1,584	* 3,929	792	-41	3,290	2,130	28
08276500	Rio Grande below Taos Junction Bridge, near Taos, New Mexico.	9,730	757	* 541	116	20	510	329	31
09315000	Green River at Green River, Utah.....	44,850	6,292	† 1,909	56	36	...	...	...
11425500	Sacramento River at Verona, California.....	21,251	18,810	43,750	214	278	...	...	...
13269000	Snake River at Weiser, Idaho.....	69,200	18,220	† 10,700	60	3	10,700	6,920	31
13317000	Salmon River at White Bird, Idaho .....	13,550	11,160	† 3,070	71	-2	3,160	2,040	31
13342500	Clearwater River at Spalding, Idaho .....	9,570	15,290	† 3,220	45	-4	4,350	2,810	31
14105700	Columbia River at The Dalles, Oregon <sup>6*</sup> .....	237,000	119,200	† 159,410	69	12	98,900	63,900	31
14191000	Willamette River at Salem, Oregon.....	7,280	123,400	132,640	72	-13	28,000	18,100	31
15515500	Tanana River at Nenana, Alaska.....	25,600	24,200	* 7,246	110	-12	7,200	4,650	31
08MF005	Fraser River at Hope, British Columbia.....	83,800	95,720	30,720	88	2	...	...	...

\*Indicates stations excluded from the combination bar/line graph. See Explanation of Data.

† Adjusted.

<sup>2</sup>Records furnished by Corps of Engineers.

<sup>3</sup>Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y., when adjusted for storage in Lake St. Lawrence.

<sup>4</sup>Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.

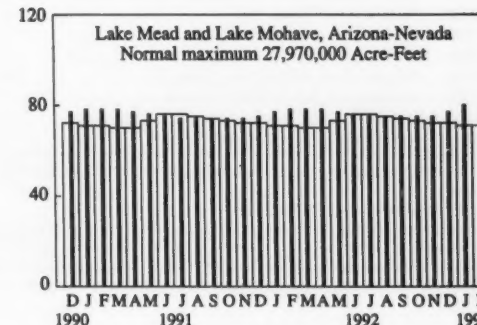
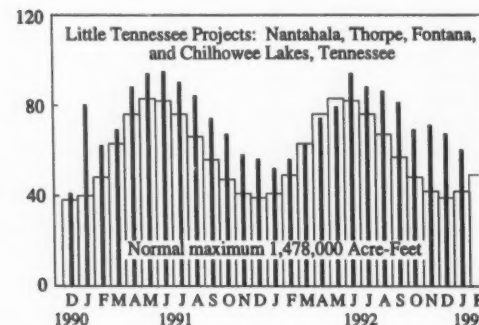
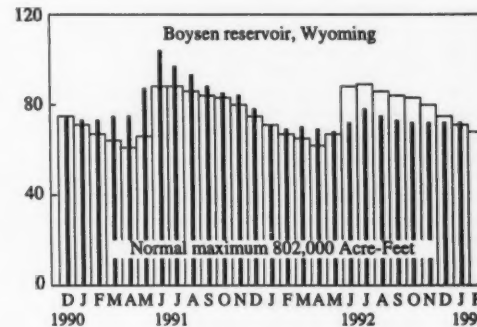
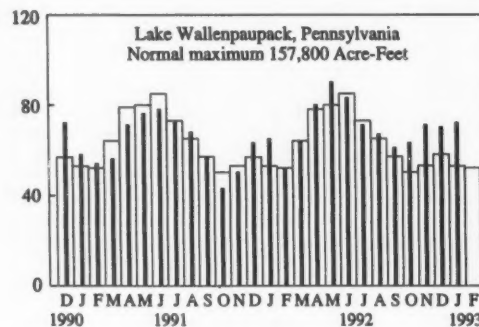
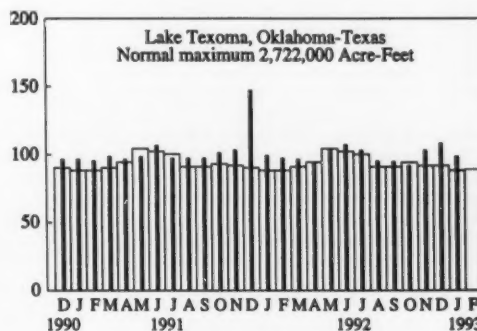
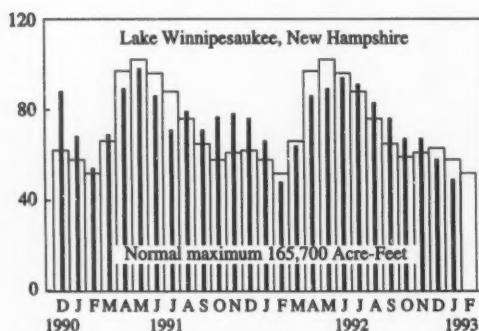
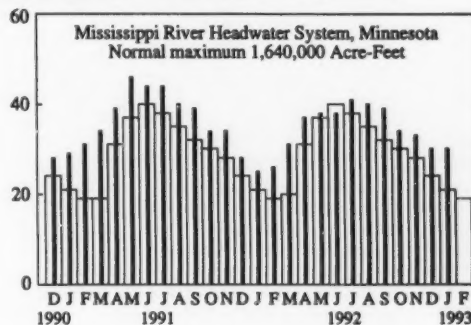
<sup>5</sup>Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

\* Above-normal range

† Below-normal range

## USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF JANUARY 1993

[Contents are expressed in percent of reservoir (system) capacity. The usable capacity of each reservoir (system) is shown in the column headed "Normal maximum" in the table Usable contents of selected reservoir systems.]



PERCENT OF NORMAL MAXIMUM

# USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS NEAR END OF JANUARY 1993

[Contents are expressed in percent of reservoir or reservoir system capacity. The usable capacity of reservoir or reservoir system is shown in the column headed "Normal maximum"]

Provisional data; subject to revision

Reservoir or reservoir system						Reservoir or reservoir system					
Principal uses:						Principal uses:					
F-Flood control						F-Flood control					
I-Irrigation						I-Irrigation					
M-Municipal						M-Municipal					
P-Power						P-Power					
R-Recreation						R-Recreation					
W-Industrial						W-Industrial					
Percent of normal maximum						Percent of normal maximum					
End of January 1993	End of January 1992	Average for end of January	End of December 1992	Normal maximum (acre-feet) <sup>1</sup>		End of January 1993	End of January 1992	Average for end of January	End of December 1992	Normal maximum (acre-feet) <sup>1</sup>	
<b>NOVA SCOTIA</b>											
Rosignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook reservoirs (P).....	31	72	57	42	2,226,300	<b>NEBRASKA</b>					
<b>QUEBEC</b>						Lake McConaughy (IP).....	† 57	55	72	56	1,948,000
Allard (P).....	* 55	62	46	76	280,600	<b>OKLAHOMA</b>					
Gouin (P).....	* 79	59	59	91	6,954,000	Eufaula Lake (FPR).....	* 108	98	88	135	2,378,000
<b>MAINE</b>						Keystone Lake (FPR).....	* 121	84	86	168	661,000
Seven reservoir systems (MP).....	49	61	50	56	4,107,000	Tenkiller Ferry Lake (FPR).....	* 120	103	93	148	628,200
<b>NEW HAMPSHIRE</b>						Lake Albus (FMR).....	* 96	79	51	87	133,000
First Connecticut Lake (P).....	* 55	37	37	64	76,450	Lake O'The Cherokees (FPR).....	* 103	88	81	117	1,492,000
Lake Francis (FPR).....	* 75	59	32	73	99,510	<b>OKLAHOMA-TEXAS</b>					
Lake Winnepesaukee (FR).....	† 49	66	58	58	165,700	Lake Texoma (FMRW).....	* 98	99	88	108	2,722,000
<b>VERMONT</b>						<b>TEXAS</b>					
Harrison (P).....	* 66	52	47	71	116,200	Bridgeport (IMW).....	* 91	98	50	91	386,400
Somerset (P).....	* 75	75	60	77	57,390	Canyon Lake (FMR).....	* 98	114	83	99	385,600
<b>MASSACHUSETTS</b>						International Amistad (FMRW).....	* 100	111	87	98	3,497,000
Cobble Mountain and Borden Brook (MP).....	* 90	81	72	95	77,920	International Falcon (FMRW).....	* 93	106	75	99	2,668,000
<b>NEW YORK</b>						Livingston (IMW).....	* 101	106	91	101	1,788,000
Great Sacandaga Lake (FPR).....	* 61	51	45	71	786,700	Potomac Kingdom Lake (IMPRW).....	† 88	95	94	88	570,200
Indian Lake (FMR).....	56	59	55	62	103,300	Red Bluff (P).....	* 51	40	32	49	307,000
New York City reservoir system (MW).....	84	60	82	72	1,680,000	Toledo Bend (P).....	* 90	93	87	91	4,472,000
<b>NEW JERSEY</b>						Twiss Run (FMR).....	* 81	47	36	79	177,800
Wanaque (M).....	* 90	75	76	83	85,100	Lake Kemp (IMW).....	90	100	86	89	268,000
<b>PENNSYLVANIA</b>						Lake Meredith (FMW).....	40	40	37	40	796,900
Allegheny (FPR).....	29	29	30	30	1,180,000	Lake Travis (FMRW).....	* 98	111	82	98	1,144,000
Pymatung (FMR).....	80	70	83	81	188,000	<b>MONTANA</b>					
Raystown Lake (FR).....	* 68	59	59	68	761,900	Canyon Ferry Lake (FMRP).....	† 71	73	80	76	2,043,000
Lake Wallenpaupack (FR).....	* 72	65	53	70	157,800	Fort Peck Lake (FPR).....	† 55	62	81	56	18,910,000
<b>MARYLAND</b>						Hungry Horse (FIPR).....	† 32	57	67	42	3,451,000
Baltimore Municipal System (M).....	82	68	85	78	61,900	<b>WASHINGTON</b>					
<b>NORTH CAROLINA</b>						Ross (FR).....	† 34	59	54	29	1,052,000
Bridgewater (Lake James) (P).....	* 94	87	80	95	288,800	Franklin D. Roosevelt Lake (IP).....	† 70	102	83	77	5,022,000
Narrows (Bald Lake) (P).....	98	93	95	96	128,900	Lake Chelan (FR).....	† 35	37	45	50	676,100
High Rock Lake (P).....	* 99	55	66	66	234,800	Lake Coulman (FR).....	† 65	90	78	64	359,500
<b>SOUTH CAROLINA</b>						Lake Merwin (P).....	98	101	97	100	245,600
Lake Murray (P).....	* 86	79	68	86	1,614,000	<b>IDAHO</b>					
Lake Marion and Lake Moultrie (P).....	* 91	75	69	89	1,777,000	Boise River (4 Reservoirs) (FIP).....	† 22	27	57	18	1,235,000
<b>SOUTH CAROLINA-GEORGIA</b>						Coeur d'Alene Lake (P).....	† 20	45	48	16	238,500
Strom Thurmond Lake (FP).....	* 67	64	60	82	1,730,000	Pend Oreille Lake (FP).....	† 34	39	51	36	1,561,000
<b>GEORGIA</b>						<b>IDAHO-WYOMING</b>					
Barton Lake (FR).....	* 87	70	59	91	104,000	Upper Snake River (8 Reservoirs) (MP).....	† 39	64	64	33	4,401,000
Sinclair (MFR).....	* 91	92	84	90	214,000	<b>WYOMING</b>					
Lake Sidney Lanier (FMR).....	* 66	54	53	67	1,686,000	Boysen (FIP).....	72	71	71	72	802,000
<b>ALABAMA</b>						Buffalo Bill (IP).....	67	58	64	63	421,300
Lake Martin (P).....	* 88	76	69	90	1,375,000	Keyhole (P).....	† 10	16	40	10	193,800
<b>TENNESSEE VALLEY</b>						Packfield, Seminole, Alkova, Korta, Glendo, and Guernsey reservoirs (I).....	† 28	37	49	26	3,056,000
Clinch Projects: Norris and Melton Hill Lakes (FPR).....	* 42	40	36	43	2,293,000	<b>COLORADO</b>					
Douglas Lake (FPR).....	12	13	14	21	1,395,000	John Martin (FIR).....	† 14	12	21	11	364,400
Hixson Projects: Chatuge, Nolichucky, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parkville Lakes (FPR).....	* 51	47	43	59	1,012,000	Taylor Park (IR).....	56	66	57	56	106,200
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR).....	* 48	47	36	50	2,880,000	Colorado-Big Thompson Project (I).....	55	54	57	55	730,300
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR).....	* 60	52	42	67	1,478,000	<b>COLORADO RIVER STORAGE PROJECT</b>					
<b>WISCONSIN</b>						Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa reservoirs (IFPR).....	† 58	61	71	59	31,620,000
Chippewa and Flambeau (FR).....	* 64	57	46	73	365,000	<b>UTAH-IDAHO</b>					
Wisconsin River (21 reservoirs) (FR).....	* 58	62	37	73	399,000	Bear Lake (FPR).....	† 15	33	58	15	1,421,000
<b>MINNESOTA</b>						<b>CALIFORNIA</b>					
Mississippi River Headwater System (FMR).....	* 30	25	21	30	1,640,000	Poison Lake (FMRP).....	52	35	52	23	1,000,000
<b>NORTH DAKOTA</b>						Hetch Hetchy (MP).....	30	37	33	37	360,400
Lake Sakakawea (Garrison) (FIPR).....	† 56	62	78	57	22,700,000	Lake Isabella (FIR).....	† 17	16	26	14	568,100
<b>SOUTH DAKOTA</b>						Pine Flat Lake (FIR).....	† 21	11	47	7	1,001,000
Angostura (I).....	† 60	75	70	59	130,770	Clair Engle Lake (Lewiston) (FP).....	† 30	22	71	28	2,438,000
Boile Fouché (I).....	† 22	30	48	18	185,200	Lake Almanor (P).....	* 67	69	53	66	1,036,000
Lake Francis Case (FPR).....	68	67	68	57	4,589,000	Lake Berryessa (FMRW).....	† 46	34	79	28	1,600,000
Lake Oahe (FIP).....	65	63	66	65	22,240,000	Millerton Lake (FI).....	63	46	63	35	503,200
Lake Sharpe (FIP).....	101	100	100	100	1,697,000	Shasta Lake (FIPR).....	† 61	31	68	46	4,377,000
Lewis and Clark Lake (FIP).....	† 93	94	102	91	432,000	<b>CALIFORNIA-NEVADA</b>					
						Lake Tahoe (IMPRW).....	† 0	0	49	0	744,600
						<b>NEVADA</b>					
						Rye Patch (I).....	† 1	4	47	1	194,300
						<b>ARIZONA-NEVADA</b>					
						Lake Mead and Lake Mohave (FMRP).....	* 80	77	71	77	27,970,000
						<b>ARIZONA</b>					
						San Carlos (IP).....	* 98	58	27	66	935,100
						Salt and Verde River System (IMPR).....	* 87	78	46	76	2,019,100
						<b>NEW MEXICO</b>					
						Conchas (FIR).....	* 84	93	12	73	315,700
						Elephant Butte and Caballo (FIPR).....	* 82	81	42	79	2,394,000

<sup>1</sup> acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second per day.

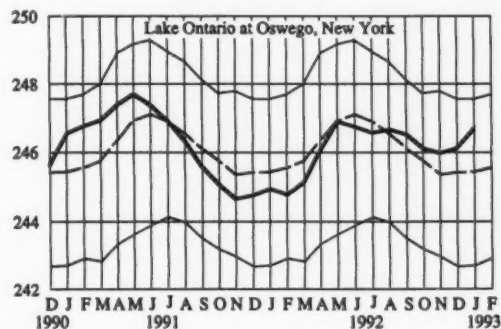
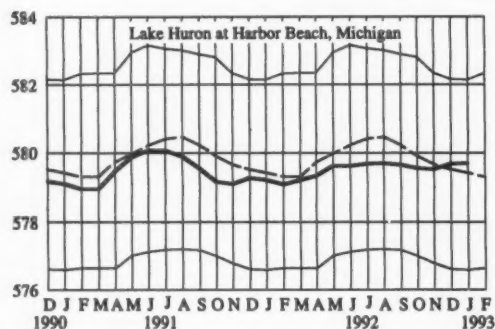
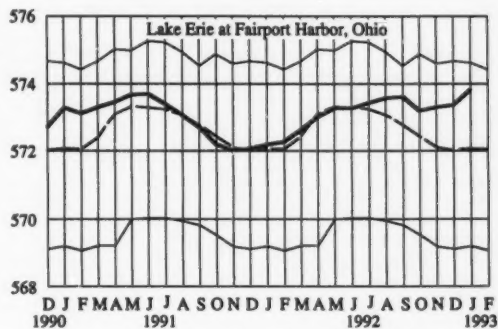
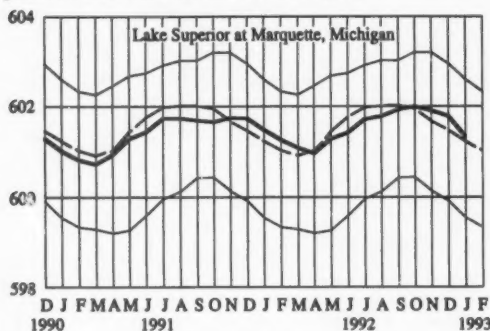
<sup>2</sup> Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

\* Above-average range

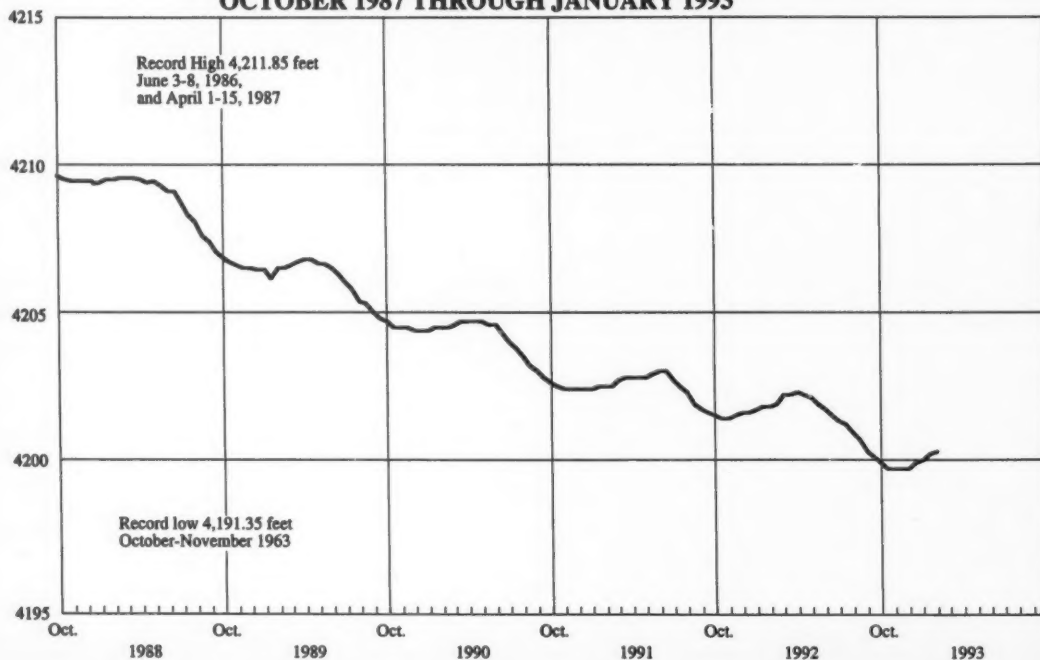
† Below-average range

## GREAT LAKES ELEVATIONS

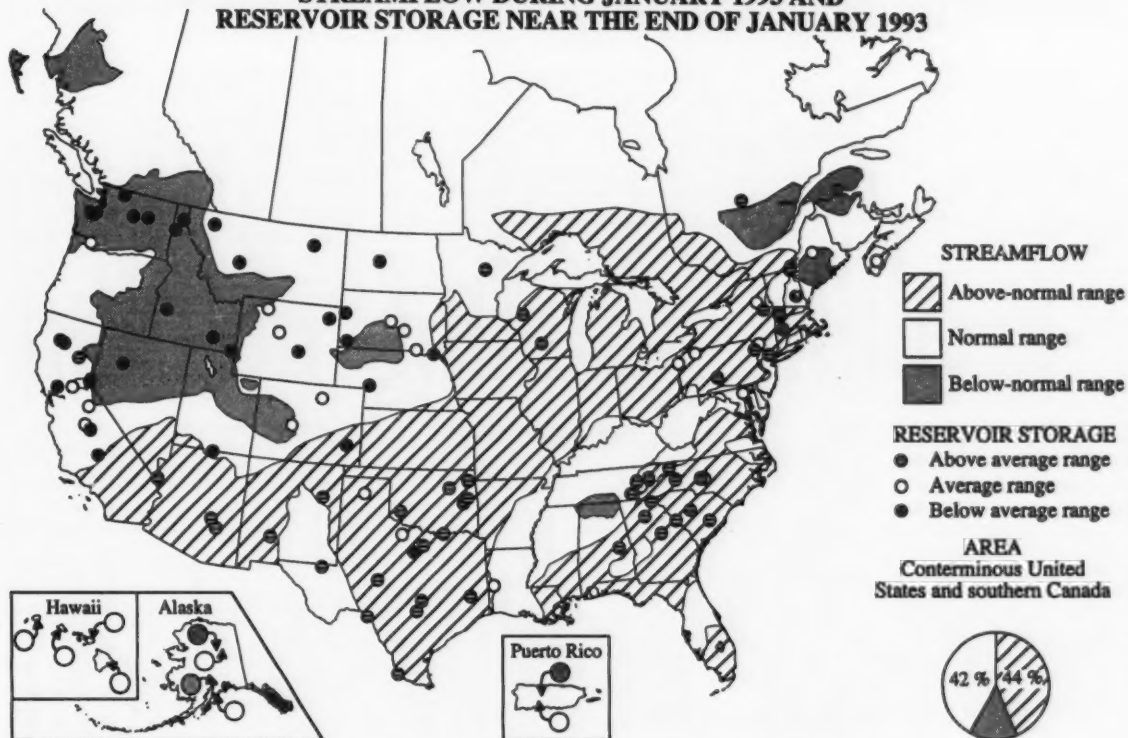
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period 1961-90. Heavy line indicates mean for current period. Data from National Ocean Service.



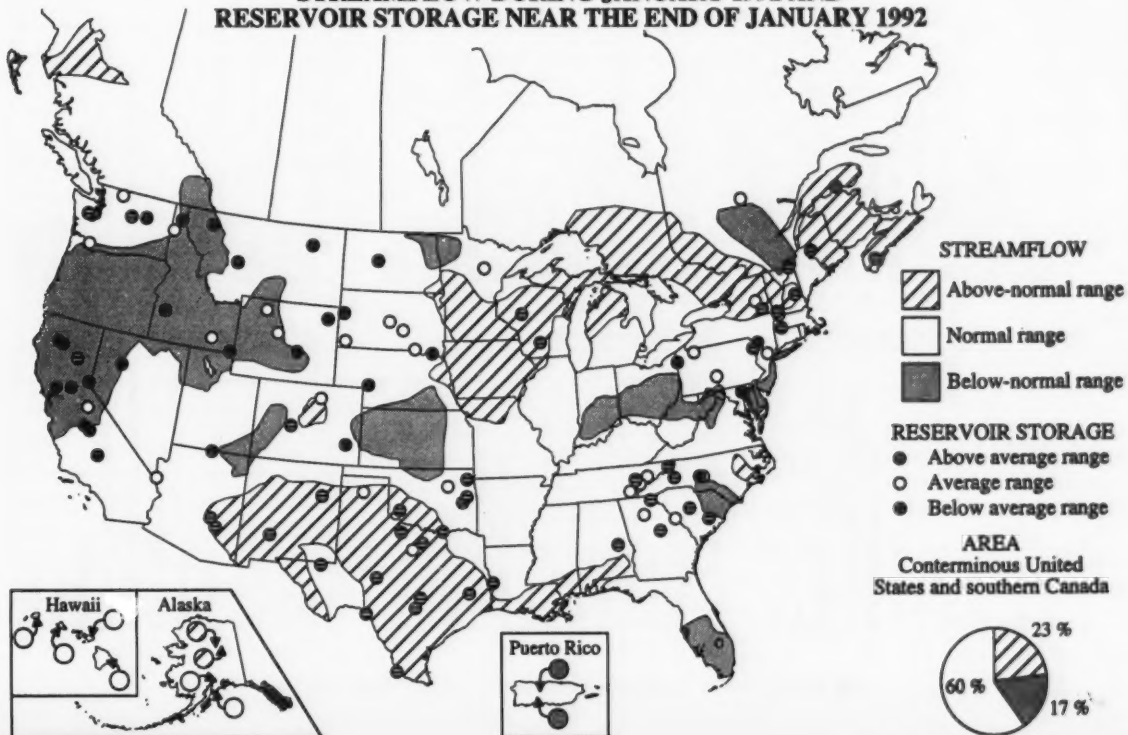
## FLUCTUATIONS OF THE GREAT SALT LAKE, OCTOBER 1987 THROUGH JANUARY 1993



**STREAMFLOW DURING JANUARY 1993 AND  
RESERVOIR STORAGE NEAR THE END OF JANUARY 1993**



**STREAMFLOW DURING JANUARY 1992 AND  
RESERVOIR STORAGE NEAR THE END OF JANUARY 1992**

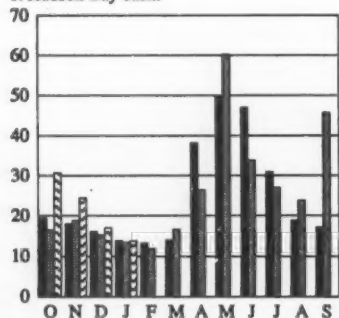


January 1993

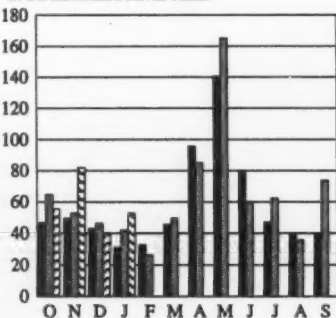
# **ACTUAL MONTHLY STREAMFLOW, 1992 AND 1993 WATER YEARS, COMPARED WITH MEDIAN MONTHLY STREAMFLOW, 1961-90**

MONTHLY MEAN DISCHARGE, IN THOUSANDS OF CUBIC FEET PER SECOND

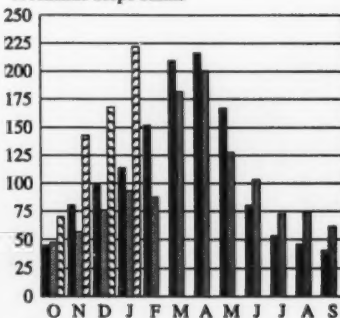
1. Hudson Bay basin



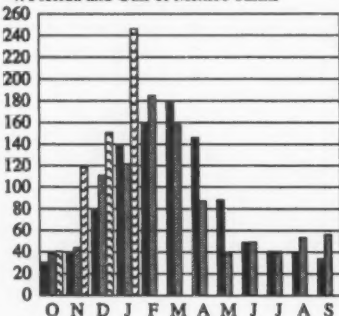
2. St. Lawrence River basin



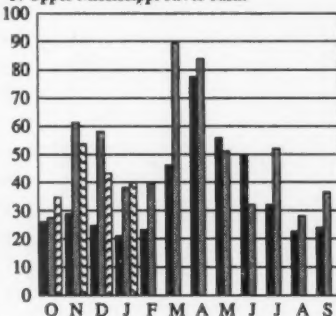
3. Atlantic Slope basins



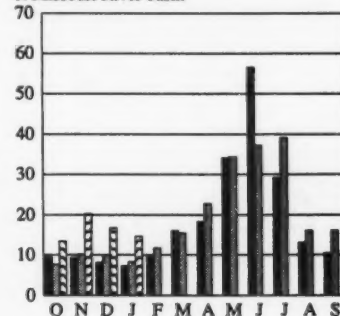
4. Florida and Gulf of Mexico basins



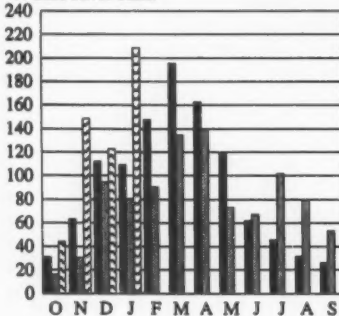
5. Upper Mississippi River basin



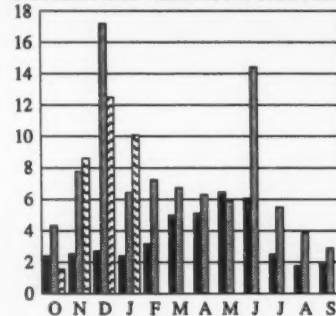
6. Missouri River basin



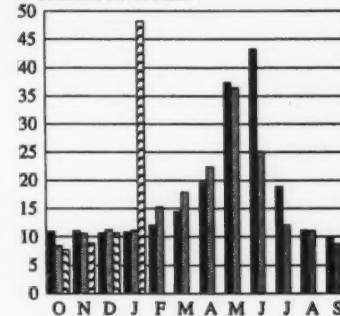
7. Ohio River basin



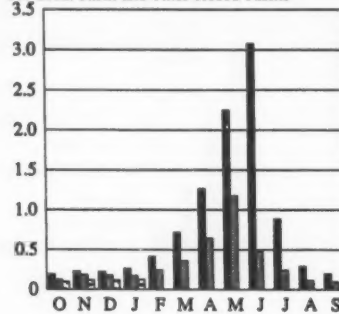
8. Southern Great Plains and Rio Grande basins



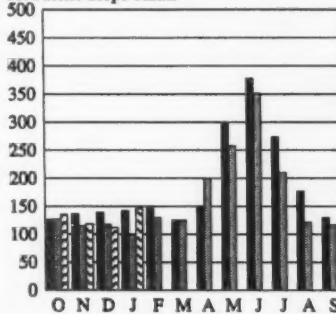
9. Colorado River basin



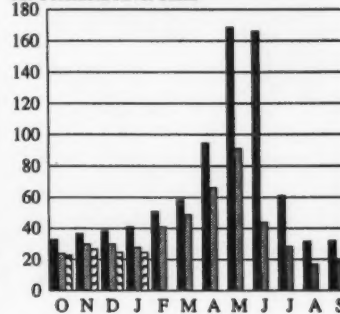
10. Great basin and other closed basins



11. Pacific Slope basins

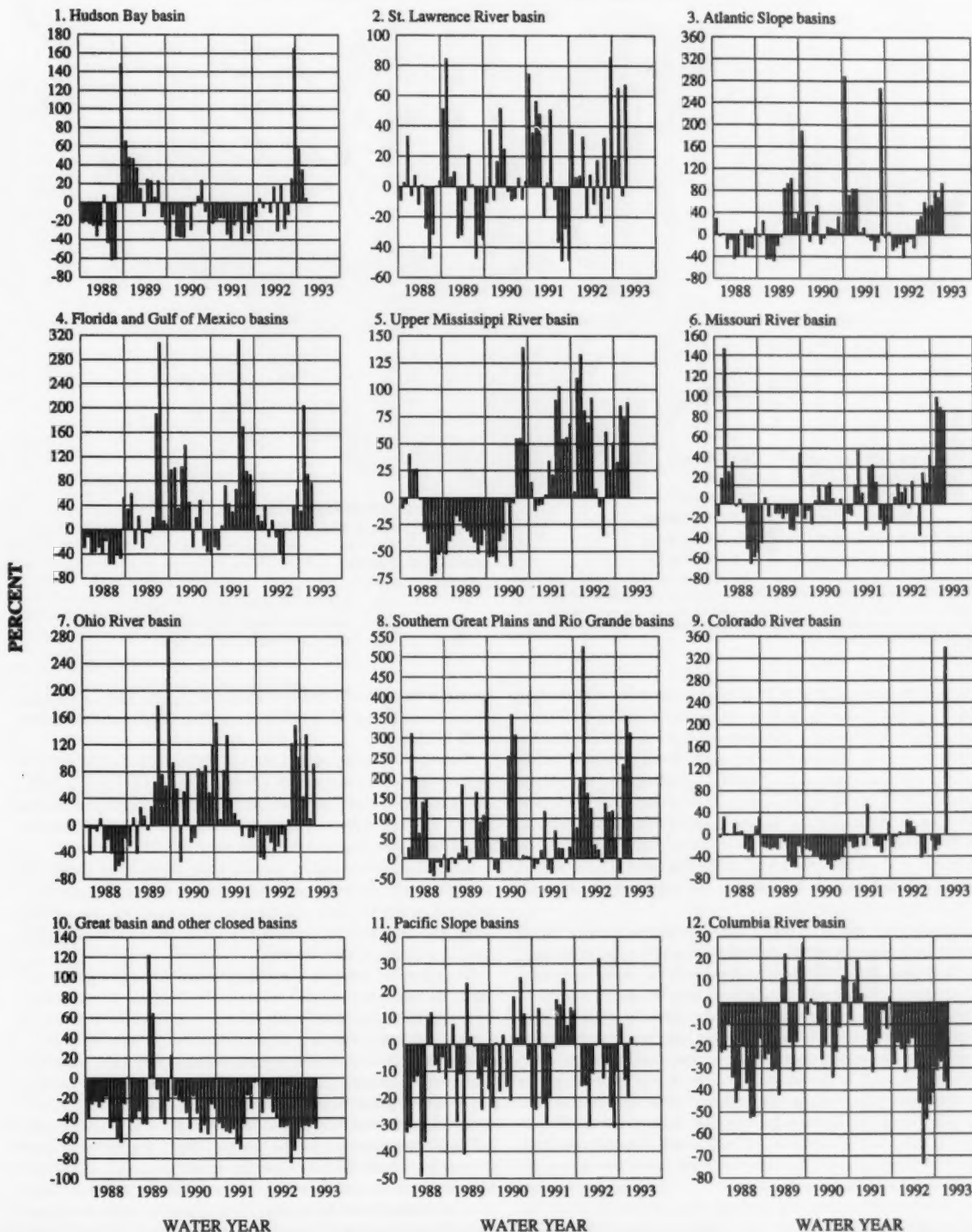


12. Columbia River basin

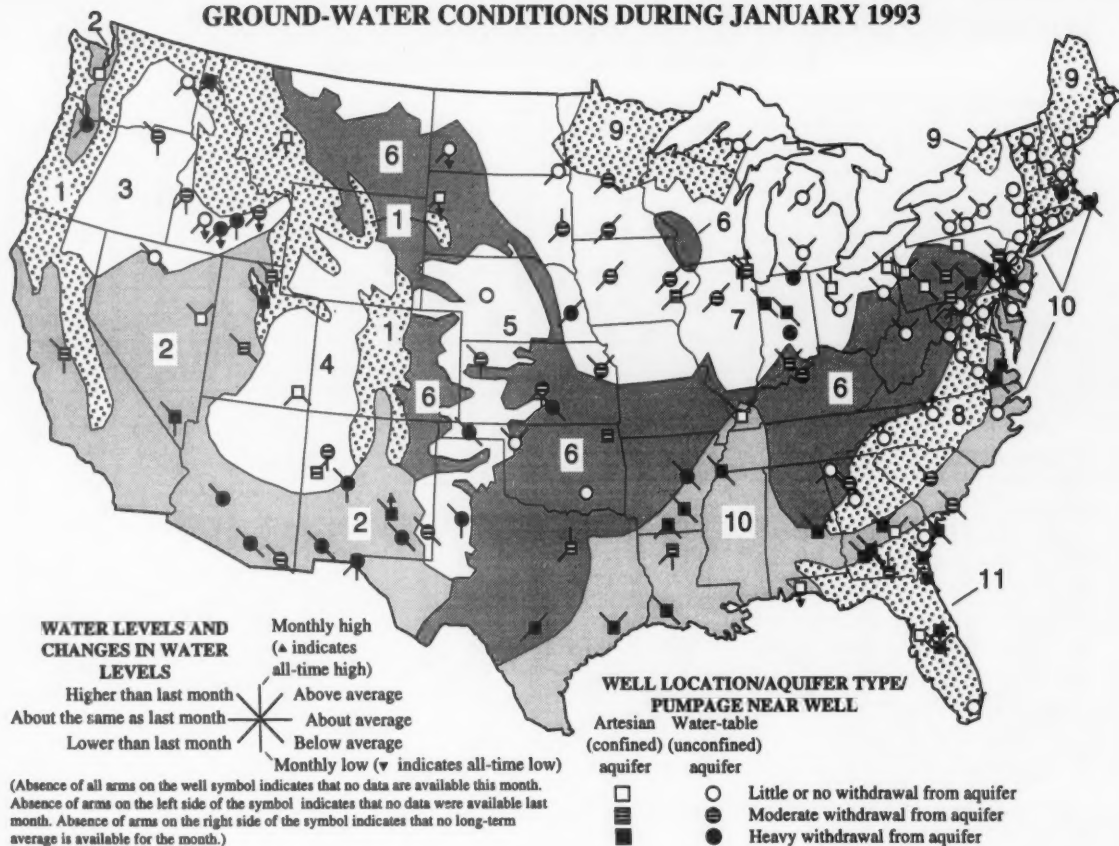


■ 1961-90 Median    ■ 1992 Water Year    ▨ 1993 Water Year

# MONTHLY DEPARTURE OF ACTUAL STREAMFLOW (OCTOBER 1987-JANUARY 1993) FROM MEDIAN STREAMFLOW (1961-90)



## GROUND-WATER CONDITIONS DURING JANUARY 1993



New extremes occurred at 36 ground-water index stations (see table on page 22) during January—25 lows (including 6 all-time) and 11 highs (including 3 all-time)—compared with 31 new extremes last month. Graphs showing water levels in 7 wells for the past 26 months are on page 23. Two of the graphs are for wells in the Nonglaciaded Central region; one in Pennsylvania and an all-time low in South Dakota. Two of the graphs are for wells in the Piedmont and Blue Ridge region; one is for a well in the Alluvial Basins region (Arizona), one graph is for a well in the Glaciaded Central region (Iowa), and one graph is for a well in the Northeast and Superior Uplands region (Connecticut).

Ground-water levels in the Western Mountain Ranges region were below last month's levels and below long-term average throughout the Region. A monthly low (for the eleventh consecutive month) occurred in the Cretaceous aquifer well near Helena, Montana.

In the Alluvial Basins region, levels were below last month's levels in Oregon and Texas, but above last month's elsewhere. Levels were below long-term averages except in the Oregon well, and one well each in Nevada and New Mexico which were above average. January lows occurred in wells in California, Nevada, New Mexico, Texas, and Utah. A January high occurred in the Oregon well. An all-time high occurred in the Roswell, New Mexico well.

In the Columbia Lava Plateau region, water levels were above last month's in Oregon and below last month's in Idaho, but below long-term averages throughout the Region. The level in Snake River Plain aquifer well near Atomic City, Idaho, declined slightly from the December level and tied the all-time low. All-time lows oc-

curred in the Snake River Plain aquifer near Eden and at Gooding, Idaho. January lows occurred in one well in Oregon and two other wells in Idaho.

Ground-water levels in the Colorado Plateau and Wyoming Basin region were below last month's levels. Levels were below long-term averages in Utah and mixed with respect to long-term averages in New Mexico. A January low occurred in the Westwater Canyon aquifer well near Grants-Bluewater, New Mexico.

In the High Plains region, ground-water levels were above last month's levels, but were below long-term averages. January lows occurred in the Ogallala aquifer well near Lubbock, Texas (the water level increased for the first time since 1991) and the Ogallala aquifer well near Colby, Kansas.

Ground-water levels in the Nonglaciaded Central region were generally below last month's levels in the Dakotas, Texas, Maryland, and Georgia; mixed with respect to last month's levels in Kansas and Pennsylvania; and above last month's levels in Kentucky, Virginia, and West Virginia. Water levels were generally above long-term averages in Virginia, Texas, Maryland, Kentucky, and West Virginia; below average in the Dakotas, Kansas, and Georgia; and mixed with respect to last month's in Pennsylvania. All-time lows occurred in the sentinel Butte aquifer well near Dickinson, North Dakota (for the ninth consecutive month) Minnelusa aquifer well near Tilford, South Dakota. A January high occurred in the Twin Mountains (Trinity) aquifer well near Hurst/Forth Worth, Texas and a January low occurred in the Equus aquifer well near Halstead, Kansas.

# **WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES—JANUARY 1993**

GROUND-WATER REGION Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well in feet	Water level in feet below land- surface datum	Departure from average in feet	Net change in water level in feet since:		Year records began	Remarks
					Last month	Last year		
<b>WESTERN MOUNTAIN RANGES (1)</b>								
Rathdrum Prairie aquifer near Athol, northern Idaho	●	485	467.6	-6.3	-1.0	-11.5	1929	
<b>ALLUVIAL BASINS (2)</b>								
Alluvial valley-fill aquifer in Steptoe Valley, Nevada	□	122	8.53	3.46	.20	-.33	1949	
Valley-fill aquifer, Elfrida area near Douglas, Arizona	●	124	100.43	-17.59	.30	1.50	1947	
Huaco bolson aquifer at El Paso, Texas	●	640	273.03	-21.62	-1.18	-1.77	1964	Jan. low
<b>COLUMBIA LAVA PLATEAU (3)</b>								
Snake River Plain aquifer near Eden, Idaho	●	208	135.6	-15.4	-2.2	-4.5	1962	All-time low
Columbia River basalts aquifer at Pendleton, Oregon	●	1,501	226.42	-32.51	.59	-6.01	1965	Jan. low
<b>COLORADO PLATEAU AND WYOMING BASIN (4)</b>								
Dakota aquifer near Blanding, Utah	□	140	48.45	-1.83	-.72	1.77	1960	
<b>HIGH PLAINS (5)</b>								
Ogallala aquifer near Colby, Kansas	●	175	130.72	-11.74	.27	-.13	1947	Jan. low
Southern High Plains aquifer at Lovington, New Mexico	●	212	57.90	-3.84	.05	1.30	1971	
<b>NONGLACIATED CENTRAL REGION (6)</b>								
Sentinel Butte aquifer near Dickinson, North Dakota	○	160	22.55	-4.07	-.02	-.80	1968	All-time low
Sand and gravel Pleistocene aquifer near Valley Center, Kansas	●	54	19.15	-1.45	.20	1.93	1937	
Glacial outwash aquifer near Louisville, Kentucky	●	94	18.77	5.77	.02	-.91	1945	
Upper Pennsylvanian aquifer in the Central Appalachians Plateau near Glenville, West Virginia	○	25	12.72	3.45	.04	-.28	1953	
<b>GLACIATED CENTRAL REGION (7)</b>								
Fluvial sand and gravel aquifer, Platte River Valley, near Ashland, Nebraska	●	12	5.82	.10	-.38	1.12	1933	
Sheyenne Delta aquifer near Wyndmere, North Dakota	○	40	6.43	.32	-.68	1.96	1963	
Pleistocene (glacial drift) aquifer at Princeton, Illinois	●	29	5.97	5.62	-.27	.03	1942	
Shallow drift aquifer near Roscommon, Michigan	○	14	4.06	.82	-.17	-.27	1934	
Silurian-Devonian carbonate aquifer near Dola, Ohio	□	51	6.05	2.51	.18	4.62	1954	Jan. high
<b>PIEDMONT AND BLUE RIDGE (8)</b>								
Water-table aquifer in Petersburg Granite, southeastern Piedmont at Colonial Heights, Virginia	○	100	16.16	-.98	1.29	.66	1939	
Weathered granite aquifer near Mocksville, North Carolina	○	31	12.06	5.55	2.10	4.52	1981	All-time high
Surficial aquifer at Griffin, Georgia	○	30	11.33	4.29	.61	6.78	1943	Jan. high
<b>NORTHEAST AND SUPERIOR UPLANDS (9)</b>								
Pleistocene glacial outwash aquifer, at Camp Ripley, near Little Falls, Minnesota	●	59	15.60	-2.21	-.47	-.60	1949	
Glacial outwash sand aquifer at Oxford, Maine	○	39	9.43	-.15	-.13	-.87	1980	
Shallow sand aquifer (glacial deposits) at Acton, Massachusetts	●	34	17.70	1.45	1.94	.78	1965	
Stratified drift aquifer near Morristown, Vermont	○	50	19.42	-.66	-1.85	-.60	1966	Jan. low
<b>ATLANTIC AND GULF COASTAL PLAIN (10)</b>								
Columbia deposits aquifer near Camden, Delaware	○	11	6.96	-.04	.48	1.71	1950	
Memphis sand aquifer near Memphis, Tennessee	■	384	107.20	-15.84	.07	-.80	1940	
Eutaw aquifer at Montgomery, Alabama	■	270	19.5	1.7	3.5	3.3	1952	
Evangeline aquifer at Houston, Texas	■	1,152	273.66	24.94	4.99	16.95	1978	
<b>SOUTHEAST COASTAL PLAIN (11)</b>								
Upper Floridan aquifer on Cockspur Island near Savannah, Georgia	■	348	31.53	-4.02	.49	1.18	1956	
Upper Floridan aquifer at Jacksonville, Florida	■	905	-25.0	-.36	.8	2.0	1930	
Biscayne aquifer near Homestead, Florida	○	20	6.65	.64	...	-.30	1932	

Ground-water levels in the Glaciated Central region were generally below last month's in the Dakotas, Iowa, Minnesota, and Nebraska; mixed with respect to last month's levels in Illinois and Michigan; and generally above last month's levels elsewhere. Water levels were generally above long-term averages except in Illinois, Ohio, and Pennsylvania where water levels were mixed with respect to long-term averages. A January low occurred in the Lower Mount Simon aquifer well at Illinois Beach State Park, Illinois, and January highs occurred in the Silurian-Devonian carbonate aquifer well near Dola, Ohio and the Big Sioux aquifer well near Dell Rapids, South Dakota. An all-time high occurred in the Ironton-Galesville aquifer well at Illinois State Beach Park, Illinois.

In Piedmont and Blue Ridge region, ground-water levels were above last month's except in New Jersey. Levels were above long-term averages except in Georgia and Virginia where water levels were mixed with respect to long-term average. January highs occurred in wells in the surficial saprolite aquifer at Griffin, Georgia; the weathered gneiss saprolite aquifer at Blantyre, North Carolina; and the surficial aquifer at Thelma, Virginia. An all-time high occurred in the weathered granite aquifer near Mocksville, North Carolina.

In the Northeast and Superior Uplands region, levels were generally above last month's levels in New York and Massachusetts; mixed with respect to last month's in Maine and New Hampshire;

## NEW EXTREMES DURING JANUARY AT GROUND-WATER INDEX STATIONS

WRD Station Identification Number	GROUND-WATER REGION  Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well	Years of record	End-of-month water level in feet below land surface datum		
					Previous January Record		
					Average	Extreme (year)	January 1993
LOW WATER LEVELS							
WESTERN MOUNTAIN RANGES (1)							
463906112043901	Cretaceous aquifer near Helena, Montana	□	110	16	31.23	37.02 (1989)	39.24
ALLUVIAL BASINS (2)							
382444121123301	Mehrten aquifer near Wilton, California	■	300	6	132.64	137.67 (1992)	139.51
361611115151301	Valley-fill aquifer near Las Vegas, Nevada	■	905	47	31.50	91.89 (1991)	93.73
351051106395301	Basin-fill aquifer at Albuquerque, New Mexico	●	980	10	32.26	36.24 (1992)	36.39
315212106245101	Huaco bolson aquifer at El Paso, Texas	●	640	28	251.41	271.26 (1992)	273.03
403803111505301	Basin-fill aquifer near Holladay, Utah	■	165	14	63.70	79.20 (1992)	85.96
414501111520001	Basin-fill aquifer near Logan, Utah	■	43	52	-17.8	-12.6 (1991)	-10.0
COLUMBIA LAVA PLATEAU (3)							
453934118491701	Columbia River basalts aquifer at Pendleton, Oregon	●	1,501	26	193.91	220.41 (1992)	226.42
432700112470801	Snake River Plain aquifer near Atomic City, Idaho	●	636	44	584.7	587.8 (1992)	*1589.3
425635114382302	Snake River Plain aquifer at Gooding, Idaho	○	165	21	135.3	147.5 (1962)	152.5
433852116244801	Shallow alluvium aquifer near Meridian, Idaho	●	32	51	9.4	11.6 (1989)	13.2
424053113412801	Snake River Plain aquifer near Rupert, Idaho	●	194	42	150.8	161.1 (1992)	164.0
423659114111601	Snake River Plain aquifer near Eden, Idaho	●	208	30	120.2	131.1 (1992)	135.6
COLORADO PLATEAU AND WYOMING BASIN (4)							
352023107473201	Westwater Canyon aquifer near Grants-Bluewater, New Mexico	●	155	37	73.60	79.51 (1992)	80.93
HIGH PLAINS (5)							
341010102240801	Ogallala aquifer near Lubbock, Texas	●	202	42	56.90	93.18 (1992)	195.21
392329101040201	Ogallala aquifer near Colby, Kansas	●	175	46	118.98	130.59 (1992)	130.72
NONGLACIATED CENTRAL REGION (6)							
465755102410701	Sentinel Butte aquifer near Dickinson, North Dakota	○	160	24	18.48	21.75 (1992)	122.55
375810097324301	Equus aquifer near Halstead, Kansas	●	57	53	22.92	39.91 (1992)	41.50
441759103261201	Minnehaha aquifer near Telford, South Dakota	□	302	8	33.11	55.43 (1991)	61.03
GLACIATED CENTRAL REGION (7)							
422863087475302	Lower Mount Simon aquifer at Illinois Beach State Park, Illinois	■	2,264	4	202.55	205.71 (1992)	207.59
NORTHEAST AND SUPERIOR UPLANDS (9)							
445227067520101	Glacial sand and gravel aquifer at Hadley Lakes, Maine	○	30	7	4.93	5.25 (1988)	5.49
443405072323501	Stratified drift aquifer near Morristown, Vermont	○	50	26	18.76	19.17 (1967)	19.42
ATLANTIC AND GULF COASTAL PLAIN (10)							
321357092341701	Sparta aquifer near Ruston, Louisiana	■	703	18	224.37	237.35 (1992)	238.66
303108087162301	Sand and gravel aquifer at Ensley, Florida	□	239	53	74.28	82.39 (1974)	185.05
372506076511703	Upper Potomac aquifer near Toana, Virginia	■	401	7	159.70	163.75 (1992)	164.44
HIGH WATER LEVELS							
ALLUVIAL BASINS (2)							
332615104303601	Roswell Basin aquifer at Roswell, New Mexico	■	324	27	51.89	34.50 (1992)	232.50
452938122254801	Troutdale aquifer near Portland, Oregon	●	715	29	99.36	87.47 (1992)	87.17
NONGLACIATED CENTRAL REGION (6)							
324842097102901	Twin Mountains (Trinity) aquifer near Hurst/Fort Worth, Texas	■	667	14	456.78	443.30 (1992)	441.02
GLACIATED CENTRAL REGION (7)							
404648083412600	Silurian-Devonian carbonate aquifer near Dola, Ohio	□	51	38	8.56	6.17 (1990)	6.05
435145096400501	Big Sioux aquifer near Dell Rapids, South Dakota	●	...	15	5.67	5.46 (1982)	2.07
422803087475304	Iron-ton-Galesville aquifer at Illinois Beach State Park, Illinois	■	1,203	4	233.50	232.43 (1989)	2227.56
PIEDMONT AND BLUE RIDGE (8)							
380217078133701	Surficial aquifer at Thelma, Virginia	○	56	40	25.24	16.40 (1973)	16.23
351808082374302	Weathered gneiss saprolite aquifer at Blantyre, North Carolina	○	58	11	33.04	26.51 (1990)	24.58
355359080331701	Weathered granite aquifer near Mocksville, North Carolina	○	31	11	17.61	14.40 (1991)	212.06
331507084171801	Surficial saprolite aquifer at Griffin, Georgia	○	30	49	15.62	12.04 (1954)	11.33
SOUTHEAST COASTAL PLAIN (11)							
304949083165301	Upper Floridan aquifer at Valdosta, Georgia	■	342	35	126.90	118.10 (1970)	117.86

<sup>1</sup> All-time month-end low.

\* Equalled previously set all-time low October 1992.

<sup>2</sup> All-time month-end high.

<sup>†</sup> First rise in water level since November 1992.

and below last month's levels elsewhere. Water levels were below long-term average in Minnesota, New Hampshire, and Vermont; mixed with respect to long-term averages in Maine; and above average elsewhere. January lows occurred in the glacial sand and gravel aquifer well at Hadley Lakes, Maine and the stratified drift aquifer well near Morristown, Vermont.

In the Atlantic and Gulf Coastal Plain region, water levels were below last month's in Florida; mixed in Arkansas, Louisiana, and

Virginia; and generally above last month's levels elsewhere. Levels were above long-term averages in Texas, Alabama, Georgia, North Carolina, and Kentucky; mixed with respect to long-term averages in New Jersey and South Carolina; and below average elsewhere.

In the Southeast Coastal Plain region, water levels were generally above last month's but mixed with respect to long-term averages. A January high occurred in the Upper Floridan aquifer well at Valdosta, Georgia.

# MONTHEND GROUND-WATER LEVELS IN SELECTED WELLS

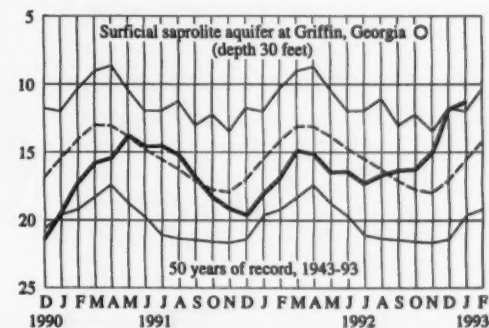
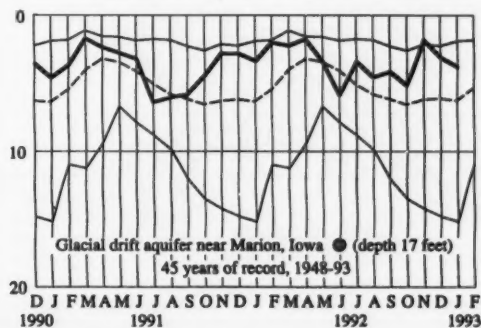
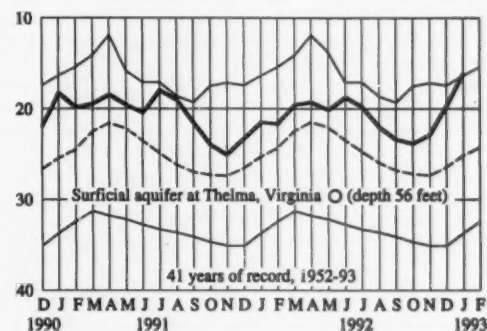
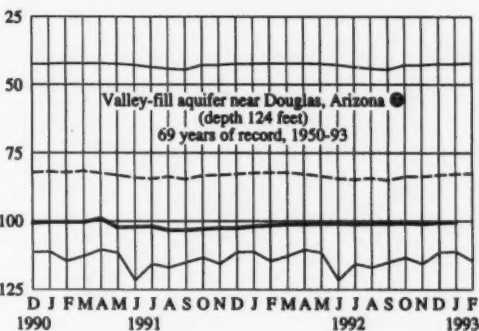
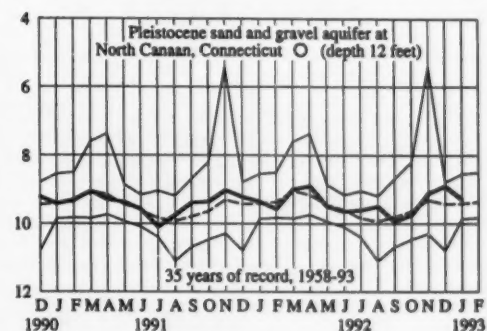
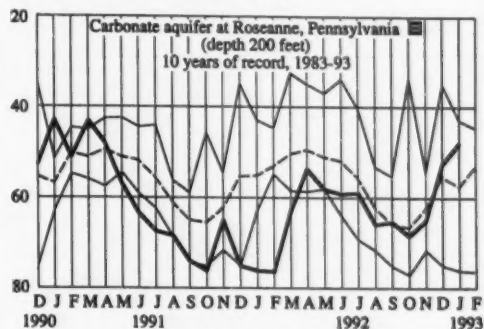
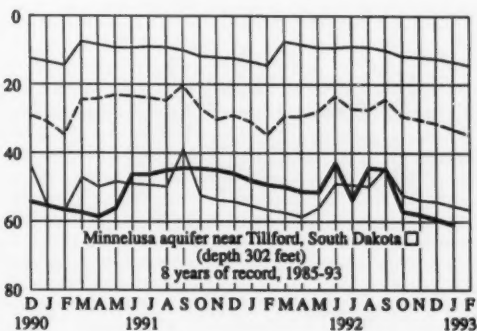
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.



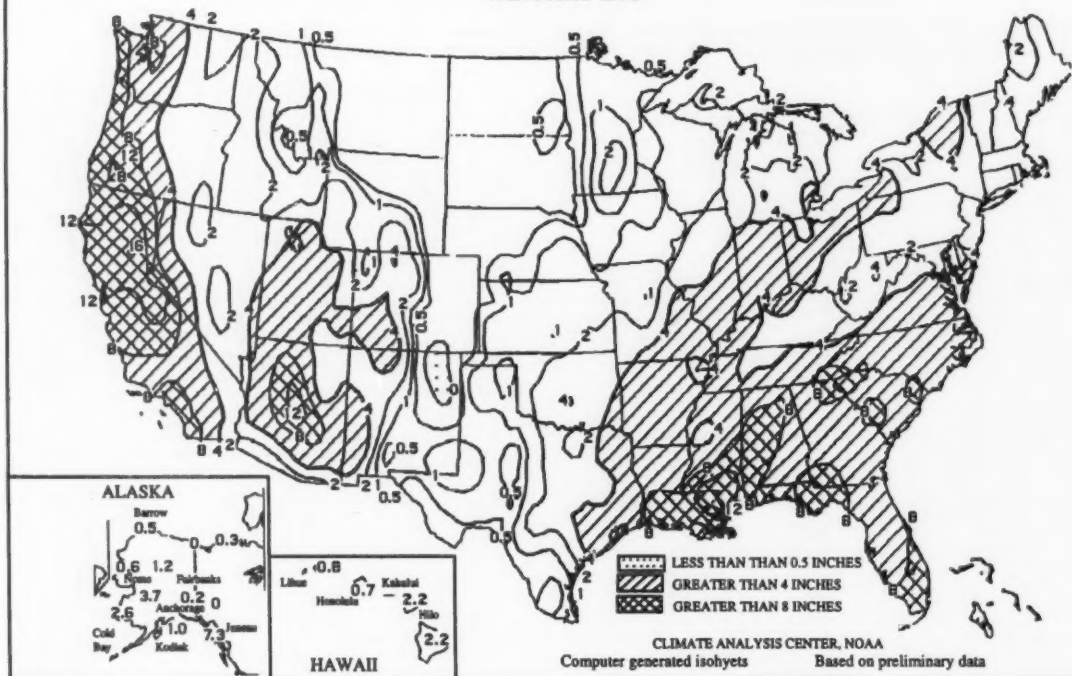
## SITE KEY

- ▲ New high
- No extreme
- ▼ New low

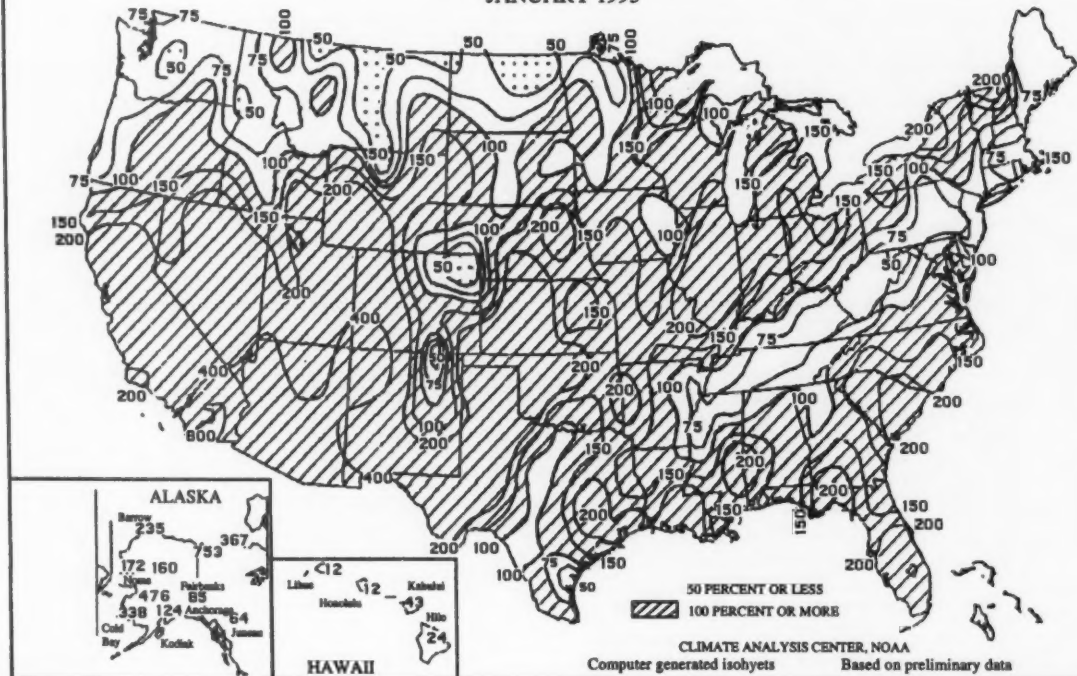
WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM



# **TOTAL PRECIPITATION, INCHES** **JANUARY 1993**



# **PERCENTAGE OF NORMAL PRECIPITATION** **JANUARY 1993**



(Adapted from *Weekly Weather and Crop Bulletin*, NOAA/USDA Joint Agricultural Weather Facility)

## JANUARY WEATHER SUMMARY

(Adapted from *Weekly Weather and Crop Bulletin*,  
NOAA/USDA Joint Agricultural Weather Facility)

A rampage of storms guaranteed California's Sierra Nevada mountains of above-normal snowpack and runoff for the upcoming snowmelt season, but major flooding affected parts of southern California and Arizona. Several western stations realized seasonal record snowfall totals, in part due to the January storms. Farther east, cool weather and a combination of rain, ice, and snow hampered residual fieldwork activities in the central and southern Plains and the Midwest. Rainy weather plagued the Southeast. But in parts of the Northwest, precipitation was less than half of normal despite above-normal snowfall, renewing drought concerns. Less than half of the normal rainfall fell on the Hawaiian islands following very wet weather in December.

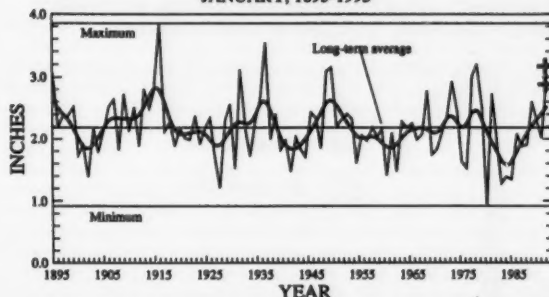
Heavy precipitation fell across California on January 1 and 6-10, and on almost a daily basis between January 12 and 21. Statewide monthly average precipitation was nearly 9.5 inches, which was about 200 percent of normal. Only northwestern coastal portions of the State had below-normal amounts. Serious flooding affected southern California and Arizona, as well as neighboring portions of northwestern Mexico. A warm, dry spell during the last 10 days of the month permitted the Southwest to dry, and allowed for considerable snowmelt in the Sierra foothills. Fortunately, much of the melting snow was captured by the State's reservoir system. The moisture content of the high elevation Sierra snowpack, based upon the observations of more than 100 automated sensors, was 175 percent of normal on February 1, promising additional hefty spring runoff. Even if no snow falls in the Sierras between now and April 1 (the traditional peak snowpack date), the water content of the snow would wind up at approximately 115 percent of normal.

Elsewhere, several stations, including Fairbanks, Alaska, and Klamath Falls, Oregon, surpassed seasonal snowfall records during January. This season's total of 78.0 inches of snow at Klamath Falls is 10 times the amount (7.8 inches) that fell during 1991-92. Salt Lake City, Utah, had its snowiest month ever. But in the East, most of the precipitation fell as rain. Beckley, West Virginia, had its least snowy January on record, recording only 0.4 inches. Hollywood, Florida, had more than its share of rain early in the month, setting a monthly rainfall record by January 11. A monthly rainfall record was also set in Miami Beach, where nearly 10 inches fell. Many locations in Arizona and southern California set January rainfall records, including San Diego, California (second wettest month ever), and Tucson, Arizona.

## UNITED STATES JANUARY CLIMATE IN HISTORICAL PERSPECTIVE

(Adapted from *Climate Variations Bulletin*,  
National Climatic Data Center, NOAA)

U.S. NATIONAL PRECIPITATION  
JANUARY, 1895-1993

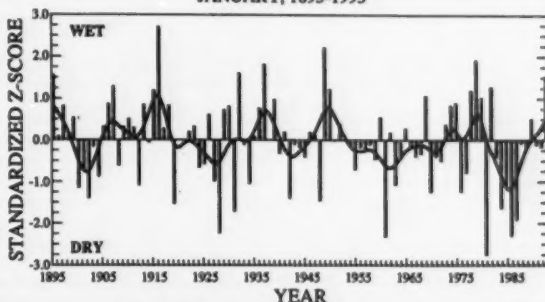


Area-averaged precipitation for the nation (graph above) was greater than the long-term mean, ranking January 1993 as the 8th wettest January on record. This was the first January in seven years where monthly precipitation had fluctuated more than one-half inch either side of the long-term mean. The preliminary value for precipitation is estimated to be accurate to within 0.14 inches and the confidence interval is plotted in the graph above as a '+'. The darker smooth curve is a nine-point binomial filter that averages out the year-to-year fluctuations and shows the longer term variations. Nearly one-third (30.9 percent) of the country experienced much wetter than normal conditions while only 2.1 percent was much drier than normal.

January 1993

Historical precipitation is shown in a different way in the graph below. The January precipitation for each climate division in the contiguous U.S. was first standardized using the gamma distribution over the 1951-80 period. These gamma-standardized values were then weighted by area and averaged to determine a national standardized precipitation value. These national weighted values were then normalized over their period of record. Negative values are dryer and positive values are wetter than the mean. This index gives a more accurate indication of how precipitation across the country compares to the local normal climate. The national standardized precipitation ranked January 1993 as the 7th wettest such month on record.

U.S. NATIONAL WEIGHTED MEAN PRECIPITATION INDEX  
JANUARY, 1895-1993

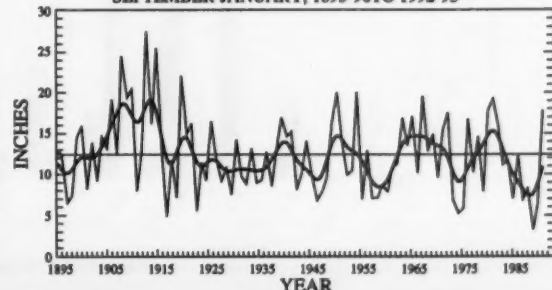


The overall precipitation pattern consisted of unusual wetness in the southern regions and in the Great Lakes with moderate overall conditions in the other regions. The Southwest and West regions had the second and sixth wettest January on record, respectively. The Southeast region had the 11th wettest January since 1895 while the East North Central and the South regions had the 20th and 21st wettest January, respectively, since records began. The remaining regions were in the middle third of the historical distribution. One notable comment is the ranking of the Northwest region. While the remainder of the west was wetter than normal, the Northwest region had the 34th driest January on record. This was due to a dominant Pacific-coast trough which allowed ample amounts of Pacific moisture to move inland from the central-Pacific coast, southward. While this pattern kept the Northwest drier than normal, it also kept them cooler than normal. It was the 10th coolest January for the Northwest region, the 18th coolest for the West region and the 25th coolest January for the West North Central region. It was the 19th warmest January on record for both the Northeast and Southeast regions of the country.

There was significant change in national long-term drought/wet conditions from December to January. The percent area of the contiguous U.S. experiencing severe to extreme long-term drought (as defined by the Palmer Drought Index) dropped from about 11 percent in December to 6 percent in January while the percent area experiencing long-term wet conditions increased dramatically from about 25 percent in December to about 33 percent of the country in January. The core drought areas continue to be focused in the Pacific Northwest and the northern Rockies, while the core wet areas stretch from the Southwest to the Great Lakes and include parts of the Southeast U.S.

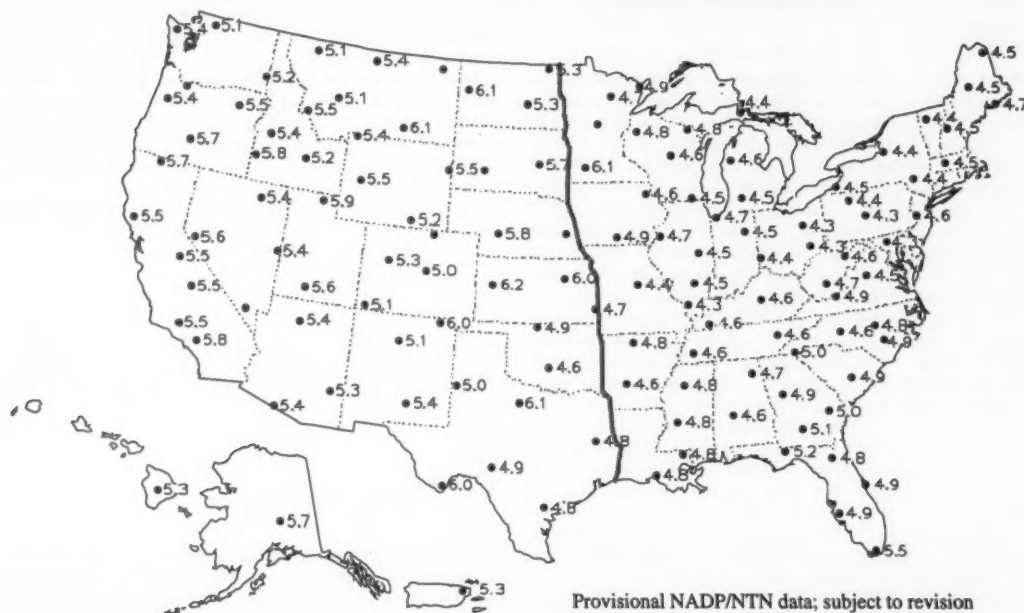
September-January 1992-93 precipitation in California shows a dramatic improvement over the amounts for the same period during the last eight years. Rain and snowfall values were considerably above the long-term mean for the rainy season to date. It was just two years ago that record deficit values were noted for the same period.

CALIFORNIA STATEWIDE PRECIPITATION  
SEPTEMBER-JANUARY, 1895-96 TO 1992-93



National Water Conditions 25

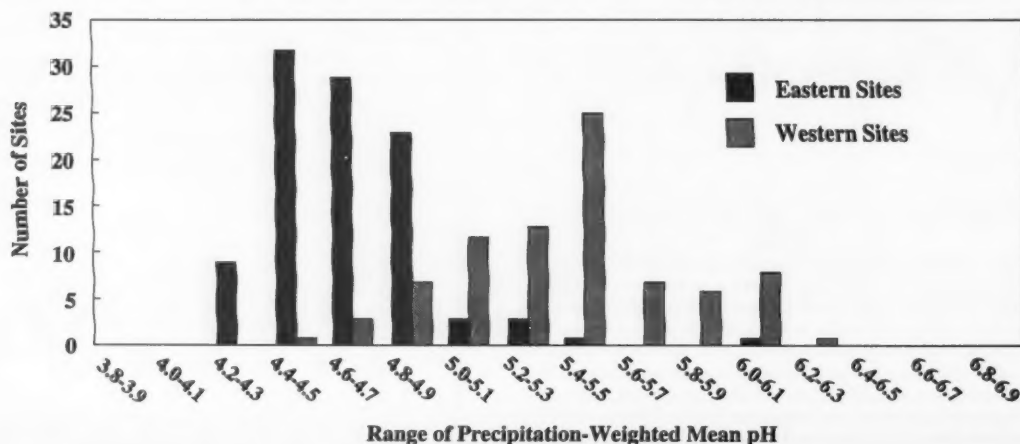
## pH of Precipitation for December 21, 1992-January 24, 1993



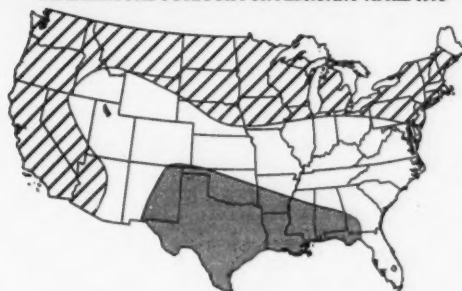
Current pH data shown on the map ( $\approx 4.9$ ) are precipitation-weighted means calculated from preliminary laboratory results provided by the NADP/NTN Central Analytical Laboratory at the Illinois State Water Survey and are subject to change. The 128 points ( $\bullet$ ) shown on this map represent a subset of all sites chosen to provide relatively even geographic spacing. Absence of a pH value at a site indicates either that there was no precipitation or that data for the site did not meet preliminary screening criteria for this provisional report.

A list of the approximately 200 sites comprising the total Network and additional data for the sites are available from the NADP/NTN Coordination Office, Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523.

**Distribution of precipitation-weighted mean pH for all NADP/NTN sites having one or more weekly samples for December 21, 1992-January 24, 1993. The East/West dividing line is at the western borders of Minnesota, Iowa, Missouri, Arkansas, and Louisiana.**



## TEMPERATURE OUTLOOK FOR FEBRUARY-APRIL 1993



## PRECIPITATION OUTLOOK FOR FEBRUARY-APRIL 1993

## OUTLOOK

- ▨ Likely above median  
 □ About equal chances  
 ■ Likely below median



Adapted from *Monthly and Seasonal Weather Outlook* prepared and published by the National Weather Service

## NATIONAL WATER CONDITIONS

## JANUARY 1993

Based on reports from the Canadian and U.S. Field offices; completed September 7, 1993

Thomas G. Ross, Editor  
 Krishnaveni V. Sarma  
 David V. Maddy

TECHNICAL  
STAFFCOPY  
PREPARATION

Thomas G. Ross  
 Kristina L. Herzog  
 Paul Kapinos  
 Krishnaveni V. Sarma

## GRAPHICS

Thomas G. Ross  
 Krishnaveni V. Sarma  
 Kristina L. Herzog  
 Paul Kapinos

The *National Water Conditions* is published monthly. Subscriptions are free on application to the U.S. Geological Survey, 419 National Center, Reston, VA 22092.

## EXPLANATION OF DATA (Revised September 1993)

**Cover map** shows generalized pattern of streamflow for the month based on provisional data from 186 index gaging stations—18 in Canada, 166 in the United States, and 2 in the Commonwealth of Puerto Rico. Alaska, Hawaii, and Puerto Rico inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows. Classifications on map are based on comparison of streamflow for the current month at each index station with the flow for the same month in the 30-year reference period, 1961-90. Shorter reference periods are used for one index station in Utah and both of the Puerto Rico index stations. Streamflow data presented herein are those published in the annual series of U.S. Geological Survey reports titled *Water Resources Data* (State) through the end of the 1991 water year—September 30, 1991. All other data are provisional.

The **streamflow ranges map** shows where streamflow has persisted in the above- or below-normal range from last month to this month and also where streamflow is in the above- or below-normal range this month after being in a different range last month. Three **pie charts** show the percent of stations reporting discharges in each flow range for both the conterminous United States and southern Canada, and also the percent of area in each flow range for the conterminous United States and southern Canada. The **combination bar/line graph** shows the monthly percent departure of the total mean from the total median flow (1961-90) and the cumulative monthly departure from median for all reporting stations (excluding seven large river stations indicated by # in the *Flow of large rivers* table and French Broad River near Newport, Tennessee) in the conterminous United States and southern Canada. Graphs for individual hydrologic basins exclude the same stations.

The comparative data are obtained by ranking the 30 flows for each month of the reference period in order of decreasing magnitude—the highest flow is given a ranking of 1 and the lowest flow is given a ranking of 30. Quartiles (25-percent points) are computed by weighted averaging of the 7th and 8th highest flows (upper quartile), 15th and 16th highest flows (middle quartile or median), and the

23rd and 24th highest flows (lower quartile). The upper and lower quartiles set off the highest and lowest 25 percent of flows, respectively, for the reference period. The median (middle quartile) is the middle value by definition. For the reference period, 50 percent of the flows are greater than the median, 50 percent are less than the median, 50 percent are between the upper and lower quartiles (in the normal range), 25 percent are greater than the upper quartile (above normal), and 25 percent are less than the lower quartile (below normal). Flow for the current month is then classified as: in the **above-normal range** if it is greater than the upper quartile, in the **normal range** if it is between the upper and lower quartiles, and in the **below-normal range** if it is less than the lower quartile. Change in flow from the previous month to the current month is classified as **seasonal** if the change is in the same direction as the change in the median. If the change is in the opposite direction of the change in the median, the change is classified as **contraseasonal**. For example: at a particular index station, the January median is greater than the December median; if flow for the current January increased from December (the previous month), the increase is seasonal; if flow for the current January decreased from December, the decrease is contraseasonal.

**Flood frequency analyses** define the relation of flood peak magnitude to probability of occurrence or recurrence interval. **Probability of occurrence** is the chance that a given flood magnitude will be exceeded in any one year. **Recurrence interval** is the reciprocal of probability of occurrence and is the average number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. **Recurrence intervals imply no regularity of occurrence**; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about **ground-water levels** refer to conditions near the end of the month. The water level in each observation well is compared with average level for the end of the month determined from the entire period of record for that well. **Changes in ground-water levels**, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data are given for four stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). **Dissolved solids** are minerals dissolved in water and usually consist predominately of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. **Dissolved-solids discharge** represents the total daily amount of dissolved minerals carried by the stream. **Dissolved-solids concentrations** are generally higher during periods of low streamflow, but the highest dissolved-solids discharges occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

FACTORS FOR CONVERTING INCH-POUND UNITS TO  
INTERNATIONAL SYSTEM UNITS (SI)

Multiply inch-pound units	By	To obtain SI units
	<b>Length</b>	
inches	$2.54 \times 10^1$	millimeters (mm)
	$2.54 \times 10^3$	meters (m)
feet	$3.048 \times 10^1$	meters (m)
miles	$1.609 \times 10^3$	kilometers (km)
	<b>Area</b>	
square miles	$2.590 \times 10^6$	square kilometers (km <sup>2</sup> )
	<b>Volume</b>	
acre-feet (acre-feet)	$1.233 \times 10^3$	cubic hectometers (hm <sup>3</sup> )
	$1.233 \times 10^4$	cubic kilometers (km <sup>3</sup> )
	<b>Flow</b>	
cubic feet per second (ft <sup>3</sup> /s)	$2.832 \times 10^{-1}$	cubic meters per second (m <sup>3</sup> /s)

004486 NWC  
SPECIAL PROCESSING DEPT  
MARCIA KOZLOWSKI  
XEROX/UNIVERSITY MICROFILMS  
ANN ARBOR, MI 48106-9999

